TEMS™ CellPlanner

WCDMA User's Guide

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Preface

Document Conventions

This document uses the following conventions:

Bold type	Window names, button names, and keyboard keys are displayed as bold text. Example: Click **Edit.**
Menu↗Selection	Navigation in menu paths are displayed as bold text with arrows between menu levels.
`Typewriter type`	File names and literal input and output. Example: `sites.xml`
Italic type	Book titles and definitions are displayed in italic. Examples: *carrier mapping, Technical Reference Manual*
Left-click Right-click	All instructions including mouse clicks assume a mouse configured with the left mouse button as primary button.

Navigation

Use the ALT ← and ALT → buttons to navigate between link jumps in the Manuals.

Assumed Knowledge

This documentation presumes that you have good knowledge about radio network planning principles and the radio technology to plan.

Disclaimer

The parameter values in this manual are just examples to help you getting started quickly, and do not constitute any performance guarantees for the planned equipment of your final network planning.

Proper parameter values depend on the equipment version, the operator's business plan, and the operator's network deployment strategy. Recommended parameter values should be provided by the operator, the equipment vendor or your service delivery organization.

Manuals

The following PDF manuals are delivered with the TEMS CellPlanner software:

Installation Guide
EN/LZT 108 9831 R4A

Describes system requirements, how to install and configure TEMS CellPlanner components and manage licenses, and provides an overview of all TEMS CellPlanner components. The procedures must be performed by a user with administrator privileges on the local computer. Some procedures require that you are an authorized TEMS CellPlanner administrator.

Common Features User's Guide
EN/LZT 108 9832 R4A

Includes Glossary of terms used in TEMS CellPlanner, concepts about licenses, and how use projects, explorer objects used by more than one radio technology, how to add sites and use site tools, filters, plots, neighbors, AMI, tuning propagation models, ASMT (Automatic Sector Model Tuning), puncturing, export and import data, and work with projects on server. Here TEMS CellPlanner administrators find how to administer users, groups and projects on servers shared by multiple users.

Common Features Technical Reference Manual
EN/LZT 108 9833 R4A

Describes radio technology independent algorithms, parameters and file formats.

GeoData User's Guide
EN/LZT 108 9834 R4A

Describes geodata concepts, supported geodata formats, conversion between different map formats, how to use map data tools in TEMS CellPlanner. The chapters about providing and importing map data are intended for administrators of map data. Other chapters are intended for users of map data.

Map Import Wizard User's Guide
EN/LZT 108 9943 R2A

Describes how to import map data using a generic wizard similar to the one provided with TEMS LinkPlanner. The intended reader is administrator of map data.

LTE User's Guide
EN/LZT 108 9944 R3A

Describes how to use LTE functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

LTE Technical Reference Manual
EN/LZT 138 0235 R2A

Describes LTE network planning principles, analysis details for advanced users, and cell ID planning principles.

WCDMA User's Guide
EN/LZT 108 9837 R4A

How to use WCDMA functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

WCDMA Technical Reference Manual
EN/LZT 108 9838 R4A

Describes concepts and overviews of WCDMA algorithms, and HSPA and MBMS in TEMS CellPlanner.

GSM User's Guide
EN/LZT 108 9835 R4A

Describes how to use the GSM functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

GSM Technical Reference Manual
EN/LZT 108 9836 R4A

Describes overlaid/underlaid cell structures, reuse patterns, manual frequency planning, automatic frequency planning (AFP), automatic hopping frequency set (HFS) planning, optimization of BSIC, HSN and MAIO, fractional load planning, and effective subscriber modeling. Also describes the GSM algorithms and file formats used in TEMS CellPlanner.

WiMAX User's Guide
EN/LZT 108 9839 R4A

Describes how to use the WiMAX functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

1
Overview of TEMS CellPlanner

This chapter provides an overview of the TEMS CellPlanner product.

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About TEMS CellPlanner

TEMS™ CellPlanner is a graphical PC-based application for designing, implementing, and optimizing mobile radio networks. It assists you in performing complex tasks, including network dimensioning, traffic planning, site configuration, frequency planning, and network optimization.

Installation

The Installation Guide describes how to install software and licenses.

Product Packaging

The product package includes the software components listed below.

What is actually installed depends on your selection in the installation wizard.

Product Components	Selecting this component installs...
• TEMS CellPlanner *named "TEMS CellPlanner Client" in the manuals*	• Radio Technology Features • Planning Features • Manuals • Map tools, geodata conversion software, demo maps, filters, scripts • Citrix software - relevant only if you are going to offer this TEMS CellPlanner installation as a Citrix service
• Enterprise Server	Enterprise Server software plus the User Administration software
• Zero Admin Server	Zero Admin Server software plus the User Administration software
• User Administration	User Administration software only
• License Server	License Server software only

Some of the components are licensed, see Licensed Components on page 1-3.

The Installation Guide provides an overview of each component and how the components relate to each other.

Licenses

The Installation Guide describes how to install licenses.
The Common Features User's Guide describes how to activate licensed features.

Licensed Components

Three of the Product Components are licensed:

TEMS CellPlanner *named "TEMS CellPlanner Client" in the manuals*	To start TEMS CellPlanner you need a license for at least one of the Radio Technology Features. Additional licenses are required for each of the Radio Technology Features and Planning Features to use.
Enterprise Server	License required to start the server
Zero Admin Server	License required to start the server

Radio Technology Features

Each of the radio technology software modules listed below require an installed and activated license. How to use the radio technology software is described in adherent user guides and technical reference manuals.

- GSM
- WCDMA
- WCDMA,HSPA
- WiMAX
- LTE

Planning Features

Additional planning features can be used together with the radio technology software. These additional software modules require a license for the feature itself and a license for the adherent radio technology:

• Automatic Cell Planning	Requires WCDMA or WCDMA,HSPA license
• Automatic Frequency Planning	Requires GSM license. This license is required also for automatic HFS planning.
• Automatic Measurement Integration and ASMT	Requires license for at least one of the Radio Technology Features ASMT = Automatic Sector Model Tuning.

Support and FAQ

For support and FAQ about TEMS CellPlanner, use the TEMS support web site:

www.ascom.com/networktesting

To provide TEMS support with information when reporting a problem, follow the instructions in chapter *Support Information* in the Installation Guide.

2
WCDMA Planning with TEMS CellPlanner

This chapter describes in general terms how to use TEMS CellPlanner for planning WCDMA networks.

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About WCDMA in TEMS CellPlanner

Predefined Frequency Bands

TEMS CellPlanner provides planning and analysis support for the following predefined WCDMA bands:

- WCDMA 850
- WCDMA 1900
- WCDMA 1900B
- WCDMA 2100

Supported WCDMA Functionality

TEMS CellPlanner supports WCDMA planning and analysis including:

- R99
- HSPA
- HSPA Evolved
- MBMS
- MIMO

Example Parameter Values

Initial and example parameter values are provided throughout this guide and do not constitute any equipment-specific performance parameters of any vendor of WCDMA equipment.

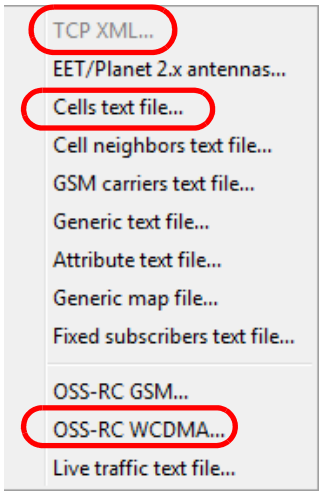
When planning for WCDMA radio networks, consult the vendor or operator for detailed information on required parameter settings for your UTRAN system version.

Importing Existing WCDMA Network Configuration

TEMS CellPlanner provides several options for importing existing data for a WCDMA network plan:

- TEMS CellPlanner project imported from TCP XML files
- Live network data imported from Bulk-CM files from Ericsson OSS-RC. You can process the data in TEMS CellPlanner to optimize coverage and traffic performance, and export the data back to Ericsson OSS-RC.
- Cells text file

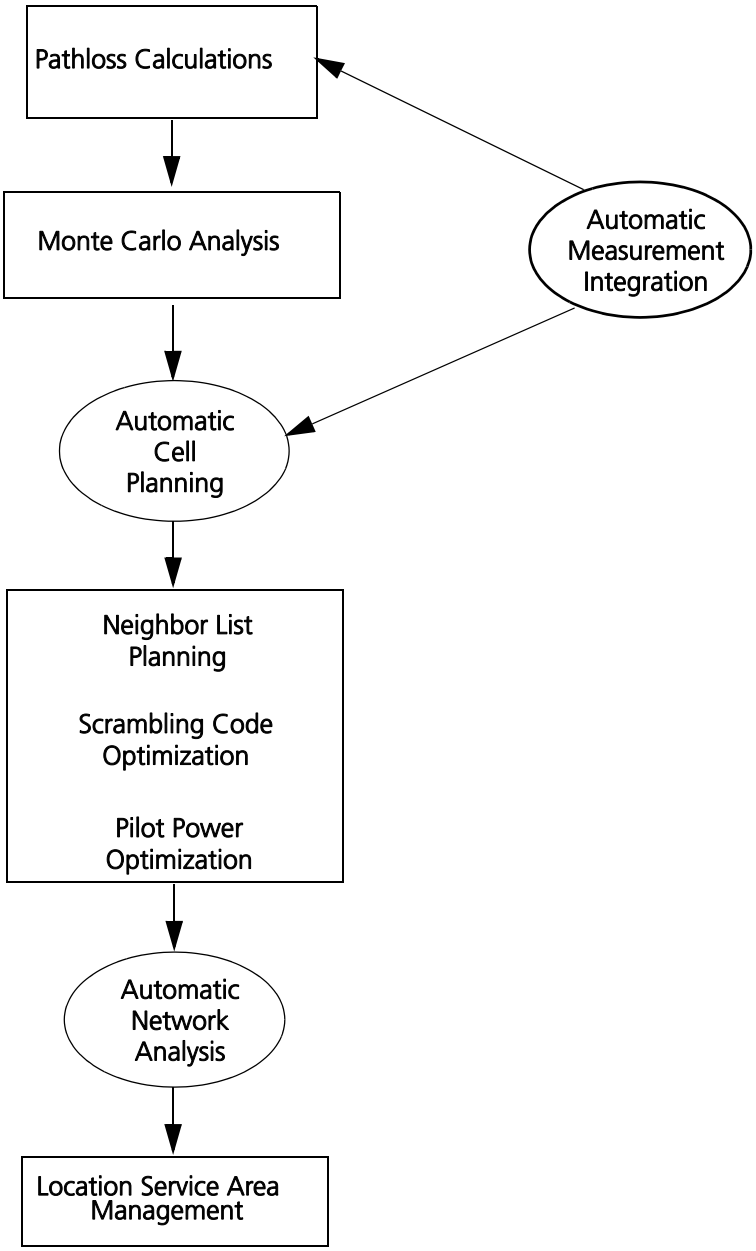
The figure below shows the **Import** menu with the above choices:



See the *TEMS CellPlanner Common Features User's Guide* for instructions on import and export of network configurations.

Workflow for WCDMA Network Planning

The following illustration shows the suggested workflow to obtain a WCDMA network design with optimal coverage:



3
Managing WCDMA Equipment and Services

This chapter describes how to add network equipment, systems, and services to a WCDMA network plan.

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Introduction

Use explorers and templates to manage elements of a WCDMA network plan.

Import Existing Project Data

You may use live network configurations or previously defined network plans by using the import and export functions of TEMS CellPlanner. The typical work flow for importing projects in TEMS CellPlanner is described in Importing Existing WCDMA Network Configuration on page 2-3.

Configure Network Elements

Use the following explorers to manage WCDMA network elements:

Define equipment types	Equipment explorer
Define systems and service types	System explorer
Define templates for network equipment, services	Template explorer
Add RBSes, sectors, and cells to a WCDMA network	WCDMA RBS explorer
Add network elements to sites	Site explorer
Add subnetworks, including RNCs, external cells	Network explorer

Use Templates for Fast Network Setup

The most frequently used network elements can be defined in templates, and the settings be inherited by configuration objects based on those templates.

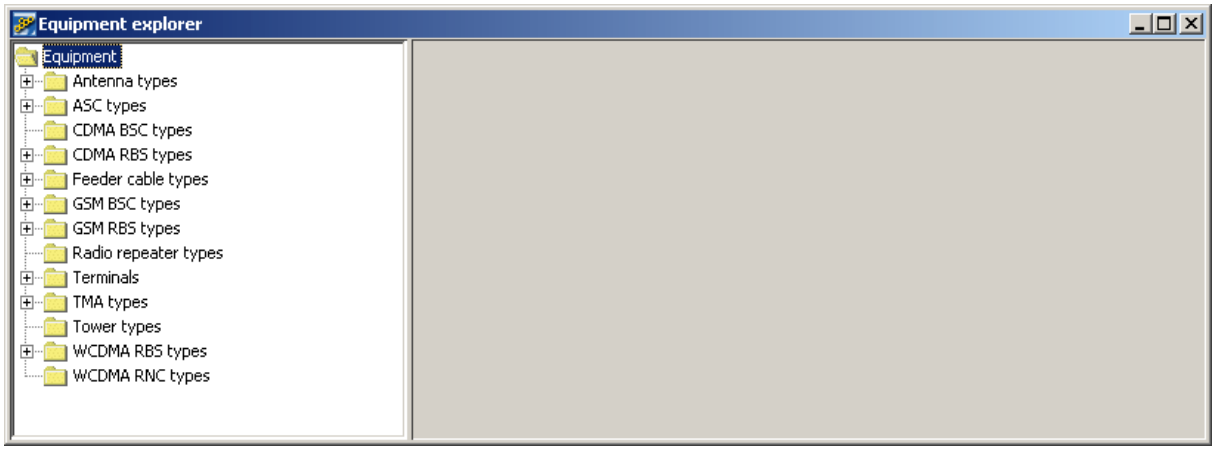
The following WCDMA network objects can be setup in templates:

- Antennas and antenna systems
- Antenna system controllers (ASCs)
- Channel groups
- Feeder cables
- Sites
- Tower mounted amplifiers (TMAs)
- Towers
- Transceivers (TRXes)
- WCDMA RBSes

About the Equipment Explorer

Use the **Equipment explorer** to manage equipment types for a network plan. You can add, modify, or delete equipment using the right-mouse button menus available in the explorer.

The following example of the **Equipment explorer** shows the WCDMA-specific equipment managed with the explorer:



Select **Utilities↗Equipment explorer** to start the equipment explorer.

Available WCDMA Equipment

You can define the following WCDMA-specific equipment using the **Equipment explorer**:

Equipment	Description
Terminals	Terminals for WCDMA networks
WCDMA RBS	Radio base station (RBS) for WCDMA networks
WCDMA RNC	Radio network controller for WCDMA networks

To define other equipment types, and to import equipment from other projects, see *TEMS CellPlanner Common Features User's Guide*.

Define WCDMA Terminals

To get accurate WCDMA Analysis results you need to define the most common UEs expected in your radio network. You define the UE types as *Terminal types* in the Equipment explorer. In the *TEMS CellPlanner Common Features Technical Reference Manual* you can read more about how terminal types as part of traffic demands affect the analysis results.

Terminal Categories

When defining an HSPA terminal type, you select a terminal category. The category determines the terminal capabilities, such as number of codes, TTI, number of tx antennas, antenna technique (MIMO, tx diversity, or none), and so forth.

The capabilities determine the highest possible bit rate supported by the terminal. To reach a certain throughput, both the terminal type and the cell must be configured to support the desired bit rate.

See *TEMS CellPlanner WCDMA Technical Reference Manual* for information on supported terminal categories, and which capabilities are required for certain bit rates.

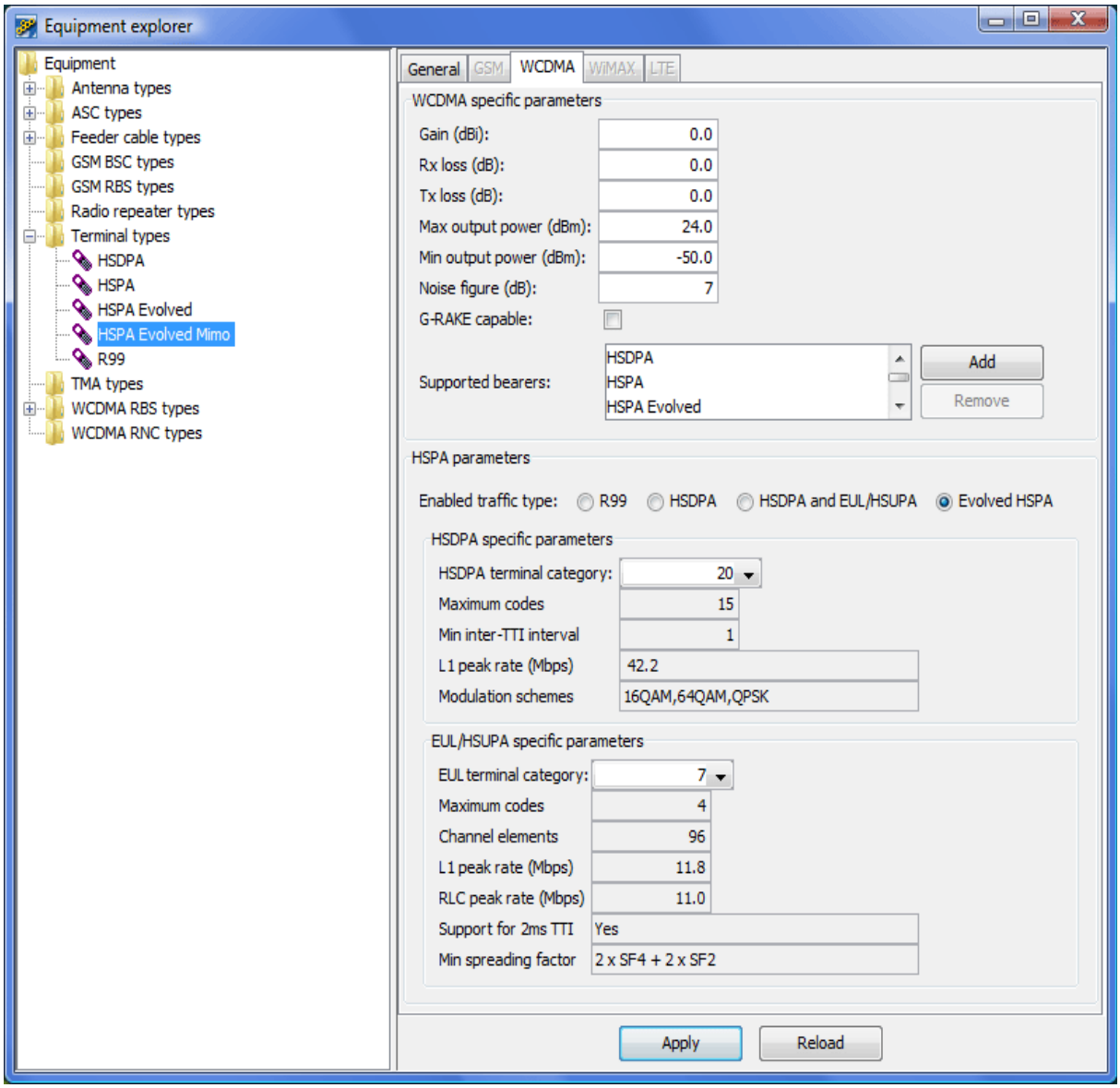
Modeling Multiple Bearers per Terminal Type

To model a multi-bearer UE you define a traffic demand mix with two or more traffic demands, each using the terminal type of the UE and one of the bearers.

A WCDMA UE in a live network shares its output power between multiple bearers (RABs) used simultaneously. The WCDMA Analysis though schedules uplink bearers to be used one at a time, as the UE's tx power sharing currently cannot be modeled in TEMS CellPlanner. This means in practice that the coverage obtained from the WCDMA Analysis is overestimated for UEs located at cell borders for the percentage of the time when real multiple bearers would be used simultaneously in uplink.

Window to Use

Use the **Terminal types - WCDMA** window to define WCDMA terminals: types:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Gain (dBi)	The gain in the terminal antenna in dBi. Range 0 - 100. Initial value = 0 dB
Rx loss (dB)	The sum of losses such as body loss, building penetration loss, and feeder loss from an external terminal antenna. Range 0 - 50. Initial value = 3 dB, assuming voice and body loss. Speech terminals: Initial values are 9 dB for in-car penetration loss, 15 dB for suburban building penetration loss, and 21 dB for urban building penetration loss. These values include 3 dB body loss for speech users. Data terminals: Initial values are 6 dB for in-car penetration loss, 12 dB for suburban building penetration loss, and 18 dB for urban building penetration loss. Values for data terminals do not include body loss. HSPA initial value: 0 dB
Tx loss (dB)	The sum of losses such as body loss, building penetration loss, and feeder loss to an external terminal antenna. Range 0 - 50. Initial value = 3 dB, assuming voice and body loss. Speech terminals: Initial values are 9dB for in-car penetration loss, 15 dB for sub-urban building penetration loss and 21dB for urban building penetration loss. These values include 3 dB body loss for speech users. Data terminals: Initial values are 6dB for in-car penetration loss, 12 dB for sub-urban building penetration loss and 18 dB for urban building penetration loss. Values for data terminals do not include body loss. HSPA initial value: 0 dB
Max output power (dBm)	Maximum output power of the terminal. Range 0 - 40. Initial value = 24, this value assumes a power class 3 mobile terminal. HSPA initial value: 24 dBm
Min output power (dBm)	Minimum output power of the terminal. Range -90 to 0. Initial value = -50, this value assumes a power class 3 mobile terminal. HSPA initial value: -50 dBm
Noise figure (dB)	The noise level of the terminal. Range 0 - 40. Initial value = 7, this value assumes a power class 3 mobile terminal. HSPA initial value: 7 dB

Field	Description
G-RAKE capable	Indicates that the terminal type has G-RAKE capability, a feature of user equipment that leads to substantial capacity gains.
Supported bearers	Bearers supported by this terminal type. To simulate HSPA, the terminal type must support A-DCH radio bearers. For simulation of multi-RABs, see Modeling Multiple Bearers per Terminal Type on page 3-5.
Add	Adds a bearer to the list of supported bearers
Remove	Removes a selected bearer from the list of supported bearers
HSPA parameters	
Enabled traffic type	Enables selection of terminal categories supporting as most the traffic type, and selects a default terminal category. Options: • R99 — Supports R99 traffic only • HSDPA — Supports HSDPA and R99 traffic. Enables selection of HSDPA terminal categories 1-12. • HSDPA and EUL/HSUPA — Supports up to HSPA (EUL and HSDPA) traffic. Enables selection of HSDPA terminal categories 1-12 and all 1-7 EUL terminal categories. • Evolved HSPA — Supports HSPA traffic with more efficient modulation schemes and MIMO for increased throughput. Enables selection of HSDPA terminal categories 13-20 and all 1-7 EUL terminal categories.
HSDPA specific parameters - Enabled if traffic type **HSDPA, HSDPA and EUL/HSUPA** or **Evolved HSPA** selected	
HSDPA terminal category	HSDPA capable terminal category. Used when calculating bit rate and throughput. The available terminals and the initially selected default terminal depend on the **Enabled traffic type** as follows: • HSDPA — 1 to 12 (default = 5) • HSDPA and EUL/HSUPA — 1 to 12 (default = 5) • Evolved HSPA — 13 to 20 (default = 17)
Maximum codes	Maximum codes this terminal category can handle for HSDPA traffic. Read-only.
Min inter-TTI interval	Minimum inter TTI interval for the HSDPA terminal category. Read-only.
L1 peak rate (Mbps)	Layer 1 peak data rate in Mbps for HSDPA. Read-only.

Field	Description
Modulation schemes	Supported downlink modulation schemes for HSDPA. Read-only.
EUL/HSPA specific parameters - Enabled if traffic type **HSDPA and EUL/HSUPA** or **Evolved HSPA** selected	
EUL terminal category	EUL capable terminal category. Used when calculating bit rate and throughput. The available terminals are of category 1 to 7, initial category = 3.
Maximum codes	Maximum codes this terminal category can handle for HSUPA/EUL traffic. Read-only.
Channel elements	Number of HSUPA/EUL channel elements used by the terminal category. Read-only.
L1 peak rate (Mbps)	Layer 1 peak data rate in Mbps for EUL/HSUPA. Read-only.
RLC peak rate (Mbps)	RLC peak rate in Mbps. Read-only.
Support for 2ms TTI	Indicates support for 2ms transmission time interval (TTI). The rates for EUL are 2 ms or 10 ms. Read-only.
Min spreading factor	Minimum spreading factor for the terminal category. Read-only.
Apply	Applies changes to values in the window.
Reload	Restores the values before non-applied changes

Procedure

Follow these steps to add WCDMA-specific parameters to terminal types:

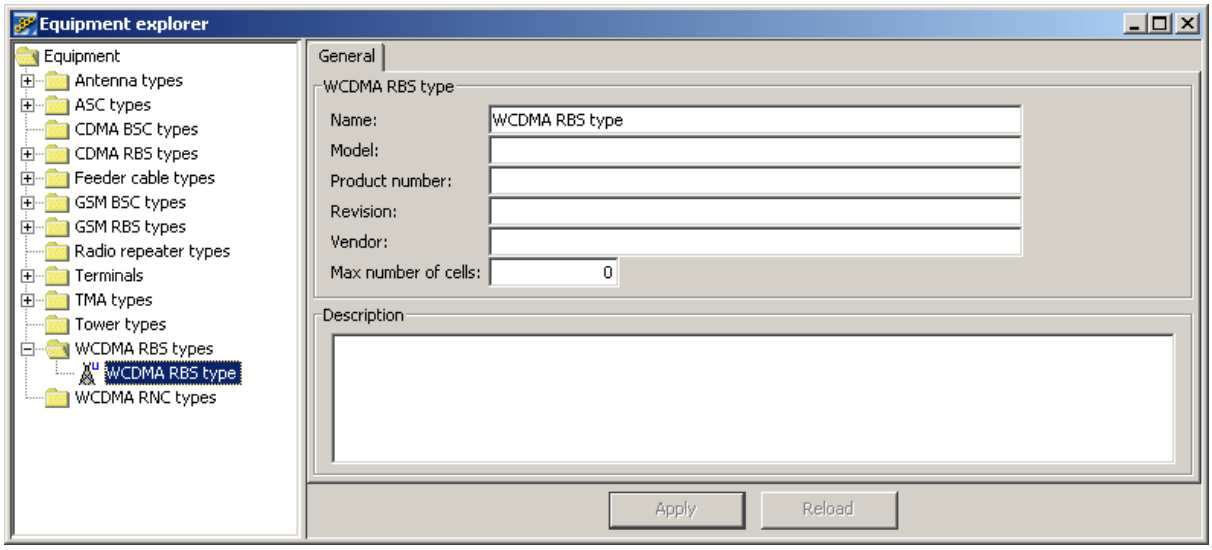
1. Select **Utilities↗Equipment explorer.**
2. Right-click the **Terminal types** folder to display the menu, and select **Add Terminal type**. The **Terminal types - General** window is displayed.
3. Select the **WCDMA** tab.
4. Add or change information as required, and click **Apply** to preserve the WCDMA terminal parameters.

Define WCDMA RBS Types

Use this procedure to define WCDMA RBS types for a WCDMA network. Enter at least one WCDMA RBS type for every WCDMA project. After you define WCDMA RBS types, use the **Site explorer** to add RBSs to sites.

Window to Use

Use the **WCDMA RBS type - General** window to enter or change WCDMA RBS information.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name for the WCDMA RBS. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Model	WCDMA RBS model.
Product number	Vendor's product number for the RBS
Product revision	Vendor's product revision number for the RBS
Vendor	Manufacturer of WCDMA RBS
Max number of cells	Maximum cells managed by the WCDMA RBS. The maximum cells that can be supported by the RBS type. Range: 0 - 6. Initial value = 0.
Description	Description of the WCDMA RBS
Apply	Applies changes to values in the window
Reload	Restores the previous values before current changes

Procedure

Follow these steps to define WCDMA RBS types:

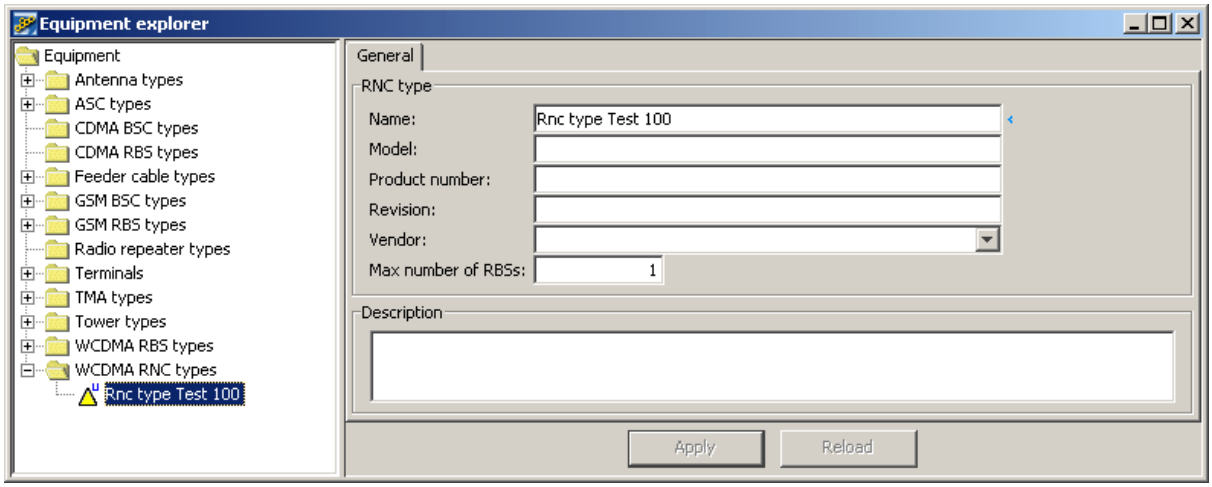
1. Select Utilities↗Equipment explorer.
2. Right-click the **WCDMA RBS Types** folder and select **Add WCDMA RBS Type**.
3. Select **Add WCDMA RBS type**. The **WCDMA RBS type - General** window is displayed.
4. Add or change information as required, and click **Apply** to preserve the WCDMA RBS type.

Define WCDMA RNC Types

Use this procedure to define RNC types for a WCDMA network. After you define RNC types, use the Network explorer to add the RNCs to a WCDMA subnetwork.

Window to Use

Use the **RNC type - General** window to define RNCs for WCDMA networks.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name for the WCDMA RNC. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Model	WCDMA RNC model
Product number	Vendor's product number of the WCDMA RNC type
Product revision	Product revision number of the WCDMA RNC type
Vendor	Manufacturer of WCDMA RNC
Max Number of RBSs	The maximum RBSs that can be supported and managed by the RNC. Range: 0 - 6. Initial value = 0.
Description	Description of the WCDMA RNC
Apply	Applies changes to values in the window
Reload	Restores the previous values before current changes

Procedure

Follow these steps to define WCDMA RNC types:

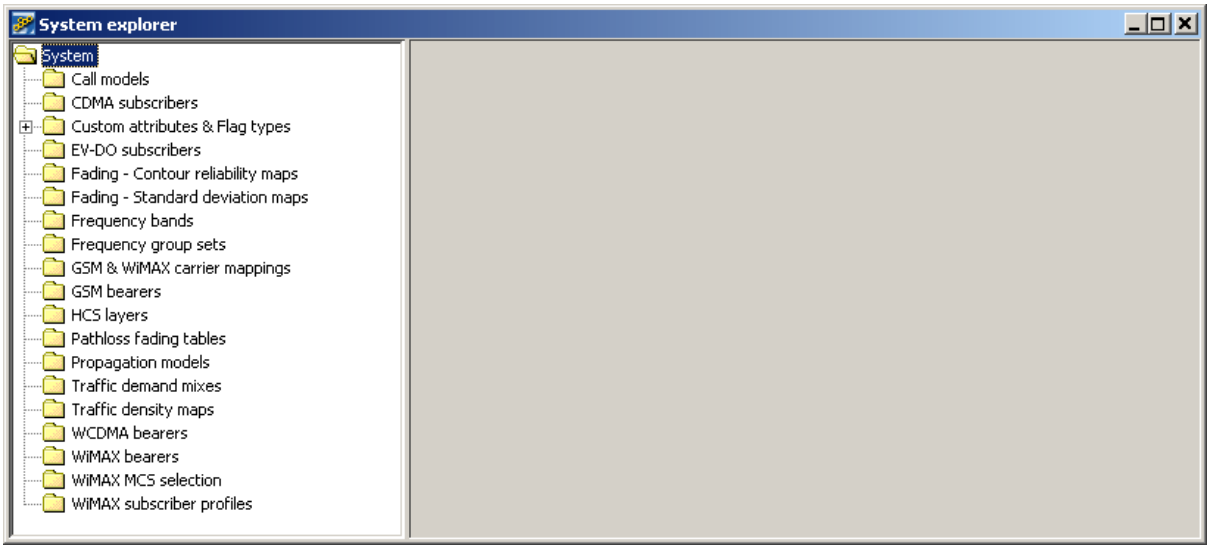
1. Select **Utilities↗Equipment explorer**.

2. Right-click the **WCDMA RNC types** folder and select **Add WCDMA RNC type** from the menu. The **WCDMA RNC type - General** window is displayed.
3. Add or change information as required, and click **Apply** to preserve the WCDMA RNC.

About the System Explorer

Use the **System explorer** to manage WCDMA systems and services for a network plan. You can add, modify, or delete systems and services using the right mouse button menus available in the explorer.

The following example of the **System explorer** shows the WCDMA-specific systems and services managed with the explorer:



Select **Utilities↗System explorer** to start the explorer.

Available Systems/Services

You can define the following WCDMA-specific systems and services using the **System explorer**:

Systems/Services	Description
WCDMA bearers	Bearers and bearer rate sets for WCDMA services

To define other systems for a WCDMA network such as frequency bands, propagation models, traffic demand mixes, and traffic density maps, see *TEMS CellPlanner Common Features User's Guide*.

Define WCDMA Frequency Bands

A WCDMA f*requency band* consists of a number of configurable carriers.

TEMS CellPlanner supports WCDMA frequency bands in FDD mode, with different frequencies used in downlink and uplink.

The 3GPP standard specifies a number of WCDMA frequency bands.

Predefined WCDMA Frequency Bands

TEMS CellPlanner provides the following predefined frequency bands:

System	Downlink Frequency Band (MHz)	Downlink UARFCN/ ARFCN(n)	Duplex Distance (MHz)
WCDMA 2100	2112.4 + 0.2 *(n-10562)	10562 ≤ n ≤ 10838	190
WCDMA 1900	1932.4 + 0.2*(n-9662)	9662 ≤ n ≤ 9938	80
WCDMA 1900 Band B	1932.5 + 0.2 *(n-412)	412, 437, 462, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687	80
WCDMA 850	869.2 + 0.2 * (n - 4346)	4346 ≤ n ≤ 4469	45

Separate channels (UARFCNs) are used for uplink and downlink. The uplink channels (UARFCN) are calculated by subtracting the duplex distance from the downlink channels (UARFCN).

The table below shows the parameters of the WCDMA 2100 frequency band:

Parameter	Initial value
Base frequency	2112.4 MHz
Base channel	10562
Duplex type	FDD
Duplex distance (MHz)	190.0 MHz
DL upper edge (MHz)	2167.6 MHz
DL lower edge (MHz)	2112.4 MHz
UL upper edge (MHz)	1977.6 MHz
UL lower edge (MHz)	1922.4 MHz
Base sub-band	
Lower edge channel	10562
Upper edge channel	10838
Number of carriers The number of UARFCNs used as carriers	277
Carrier distance The distance between carriers, expressed as the gap in number of UARFCNs	1

Parameter	Initial value
Lower edge frequency	2112.4 MHz
Upper edge frequency	2167.6 MHz
Channel separation	0.2 MHz

Define WCDMA Bearers

Use this procedure to define bearers for WCDMA networks.

Bearer Parameters

WCDMA analysis is based on traffic simulations for WCDMA radio bearers. The bearer specific parameters must be defined in correctly to achieve trustworthy results from WCDMA analysis.

Some WCDMA bearer specific parameters depend on the actual algorithm and hardware implementation of the equipment vendors. For details on any parameters, refer to the vendor of the UTRAN equipment. Use the suggested parameter values as a starting point for analysis until confirmed vendor specific data is available.

As a general rule, the maximum power setting for any WCDMA bearer should not exceed 20% of the total cell output power. Furthermore, the power setting for the traffic channels should be made in relation to the initial CPICH power.

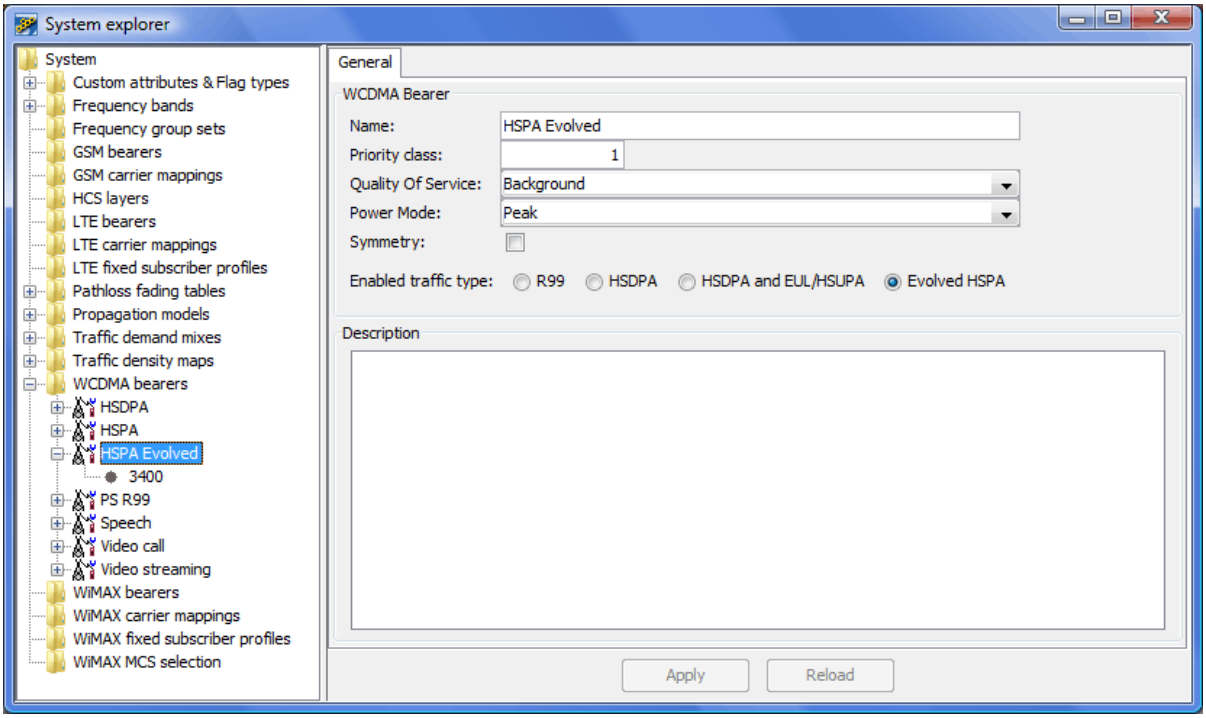
Using Symmetry

When symmetry is used, the system performs channel rate switching simultaneously for UL and DL, a normal application for circuit switched radio bearers that support multiple rates on both UL and DL. When one link fails, the other link is disconnected as well.

When you do not use symmetry, channel rate switching can be done independently for UL and DL, a normal application for packet switched radio bearers that support multiple bit rates. When one link fails, the other link may still be active because the links are treated independently.

Window to Use

Use the **WCDMA bearers - General** window to define bearers for WCDMA networks:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the WCDMA bearer. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Priority class	Priority class of the WCDMA bearer. With congestion, *congestion control* disconnects users first on bearers with low priority. Priority 1 = highest priority; larger numbers equal lower priority. For HSPA, set the priority class to a value higher than 1 to allow simultaneously simulated R'99 traffic to get higher priority in the congestion control algorithms.
Quality of Service	Quality of Service class of the bearer. Options include: • Background • Conversational • Interactive • Streaming

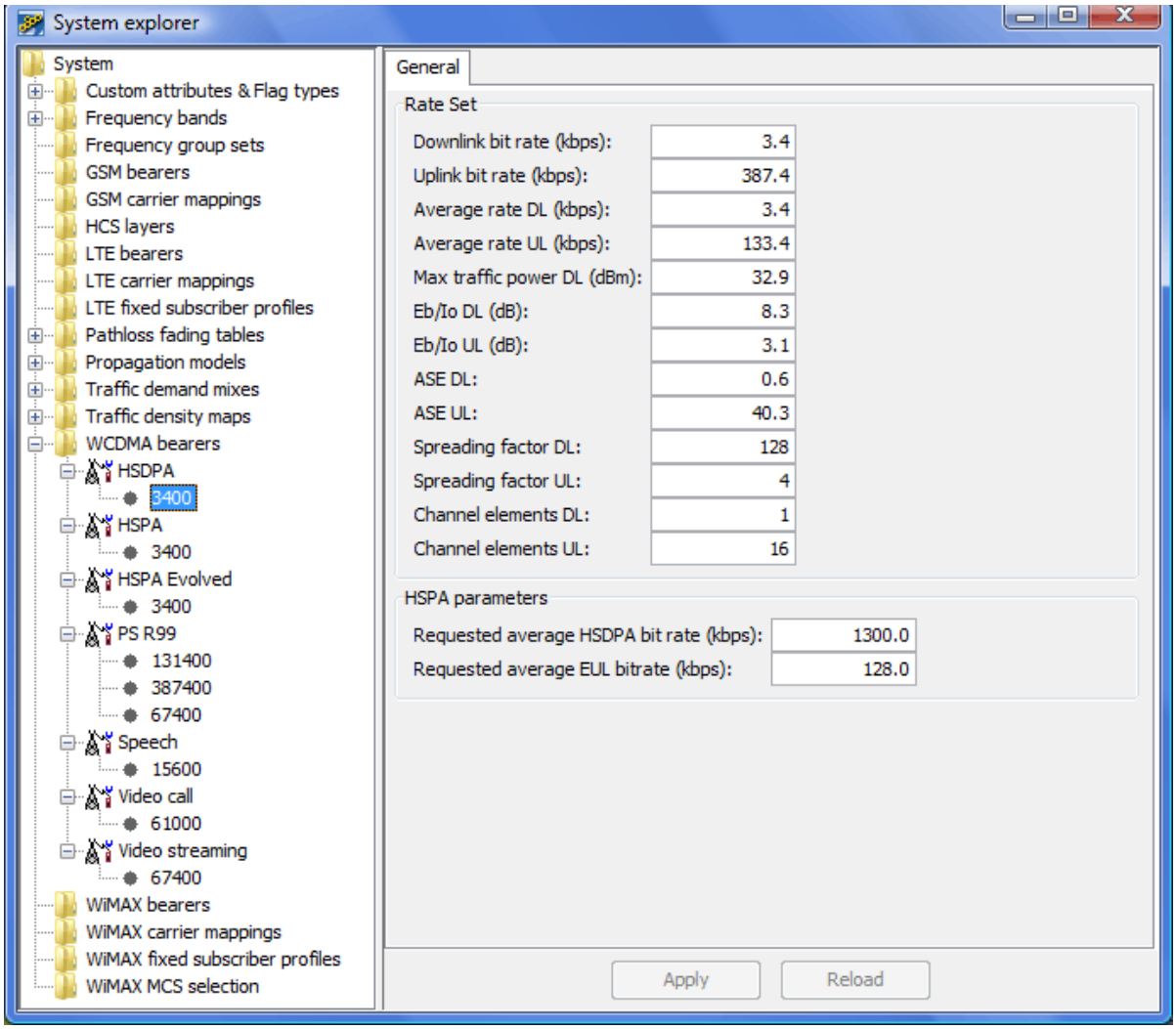
Field	Description
Power mode	The power mode for the bearer. Options include: • Average • Peak
Symmetry	Indicates if uplink and downlink rate switching is handled simultaneously. Conversational bearers are treated as symmetrical bearers.
Enabled traffic type	• R99 • HSDPA — Bearer associated with internal A-DCH radio bearer • HSDPA and EUL/ HSUPA — Bearer associated with internal E-DCH channel • Evolved HSPA — Bearer associated with internal E-DCH channel
Description	Description of the bearer
Apply	Applies changes to values in the window
Reload	Restores the previous values before current changes

Define WCDMA Bearer Rate Sets

Use this procedure to define the rate sets for the WCDMA bearers.

Window to Use

Use the **Rate sets - General** window to define WCDMA bearer rate sets:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Downlink bit rate (kbps)	The maximum downlink bit rate of the rate set. Range: 1 - 2048. Initial value = 1. The peak rate is defined as the maximum information bit rate, the sum of the user information on the bearer, and the required information for radio resource control on the DCCH signaling bearer. HSDPA initial value: 3.4
Uplink bit rate (kbps)	The maximum uplink bit rate of the rate set. Range: 1 - 2048. Initial value = 1. The peak rate is defined as the maximum information bit rate, the sum of the user information on the bearer, and the required information for radio resource control on the DCCH signaling bearer. HSDPA initial values of 64, 384
Average rate DL (kbps)	The average downlink bit rate for the rate set. The average rate value is used to calculate the interference generated by the bearer when using the rate set. The average rate depends on the power mode in which the service is run. For the average power mode, calculate the average bit rate from the peak bit rate and an assumed user activity factor. For peak power mode, the user activity is calculated as the ratio between peak and average bit rates you define. Example: Peak rate 64 kbps/average rate 6.4 kbps gives a 10% user activity factor. HSDPA initial value: 3.4
Average rate UL (kbps)	The average uplink bit rate for the rate set. The average rate value is used to calculate the interference generated by the bearer when using the rate set. The average rate depends on the power mode in which the service is run. For average power mode calculate average bit rate from peak bit rate and an assumed user activity factor. For peak power mode, the user activity is calculated as the ratio between peak and average bit rates you define. Example: Peak rate 64 kbps/average rate 6.4 kbps gives a 10% user activity factor. HSPA initial value: 32, 192

Field	Description
Max. traffic power DL (dBm)	The maximum downlink traffic power relative to CPICH power (dB) that can be allocated to the bearer when using the rate set. The max TCH power on DL must not exceed 20% of the total cell output power. Range: 1 - 50. Initial value = 33 dBm. The maximum downlink traffic power has to be changed if the PCPICH channel power is changed.
Eb/Io DL (dB)	The target Eb/Io on the downlink for the WCDMA bearer using the rate set. The value depends on the environment surrounding the subscriber, the speed at which the subscriber moves, the frequency band, the system release version, the service type, and the bit rate for the transmission. Recommended Eb/No values for coverage and capacity dimensioning should be available from the system supplier. HSDPA initial value: 5.0
Eb/Io UL (dB)	The target Eb/Io on the uplink for the WCDMA bearer using the rate set. The value depends on the environment surrounding the subscriber, the speed at which the subscriber moves, the frequency band, the system release version, the service type and the bit rate for the transmission. Recommended Eb/No values for coverage and capacity dimensioning should be available from the system supplier. HSDPA initial value: 3.5
ASE DL	Number of downlink air-interface speech equivalents used by the WCDMA bearer using the rate set. Range: 0.1 - 50. Initial value = 1.0, WCDMA system initial value. Recommended ASE values should be available from the system supplier HSDPA initial value: 0.61
ASE UL	Number of uplink air-interface speech equivalents used by the WCDMA bearer using the rate set. Range: 0.1 - 50. Initial value = 1.0, WCDMA system initial value. Recommended ASE values should be available from the system supplier HSDPA initial values: 8.32, 40.27
Spreading factor DL	Downlink spreading factor for the bearer using the rate set, used for code tree and power calculations. Range: 1 - 256. Initial value = 256, WCDMA system initial value. HSDPA initial value: 128

Field	Description
Spreading factor UL	Uplink spreading factor for the bearer using the rate set. Range: 1 - 256. Initial value = 256, WCDMA system initial value. HSDPA initial values: 16, 43
Channel elements DL	Number of downlink channel elements required to support the WCDMA bearer using the rate set. Range: 0 - 32. Initial value = 1.
Channel elements UL	Number of uplink channel elements required to support the WCDMA bearer using the rate set. Range: 0 - 32. Initial value = 1. HSDPA initial value: 15
HSPA parameters	
Requested average HSDPA bit rate (kbps)	Average HS-DSCH bitrate requested by a user/terminal on this A-DCH bearer. Provides input to the Monte Carlo simulation for the actual required bit rate by a typical user with a selected terminal category. This parameter is used in the downlink interference calculations for the cell. Min = 0, Max = 14000, Initial value = 100.
Requested average EUL bit rate (kbps)	Average bitrate in kbps requested by a user/terminal on this E-DCH bearer. Provides input to the Monte Carlo simulation for the actual required bit rate by a typical user with a selected terminal category. This parameter is used in the uplink interference calculations for the cell. Min = 0, Max = 6020, Initial value = 128.
Apply	Applies changes to values in the window
Reload	Restores the previous values before current changes

Procedure

Follow these steps to add WCDMA bearer rate sets:

1. Select **Utilities↗System explorer.**
2. Right-click the **WCDMA bearer** folder, and select **Add WCDMA bearer** from the menu. The **WCDMA bearer - General** window is displayed. Expand the tree to display the rate set created when you created the bearer.
3. Add or change rate set information as required according to recommended values from the system supplier, and click **Apply** to preserve the settings.

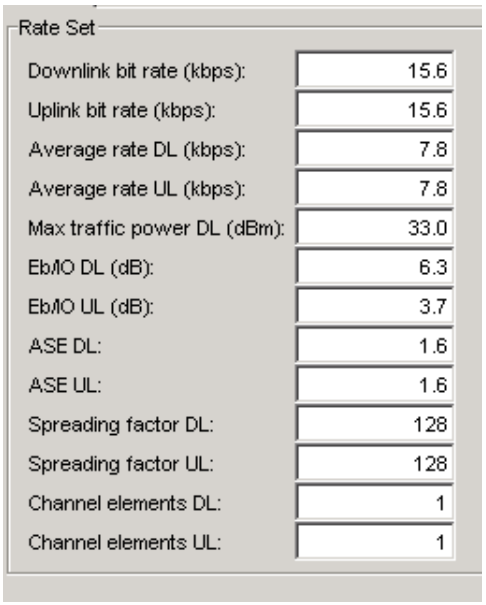
Example of Rate Sets

You need to define your rate sets according to recommended values from the system supplier.

The examples below show typical configurations applicable for a certain WCDMA network product release, for specific service types on a certain frequency band and certain typical urban (TU) or rural area (RA) environment.

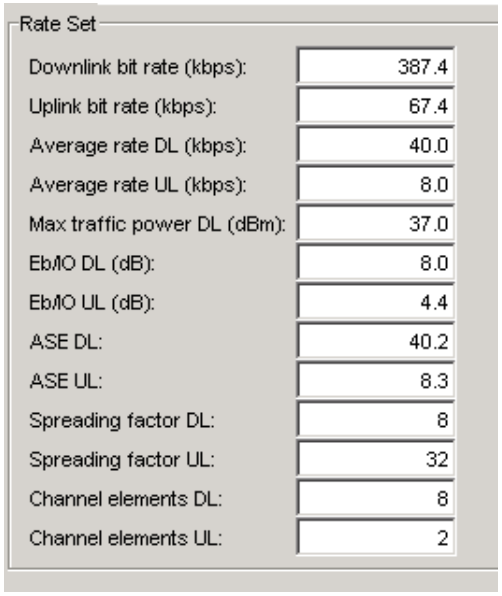
Example of Speech 12.2 Rate Set

The following example shows a rate set for speech 12.2 kbps:



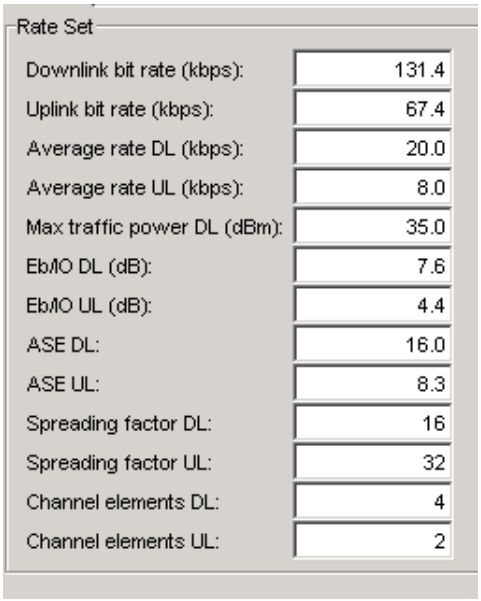
Example of Interactive Web Bearer 64/384 Rate Set

The following example shows a rate set for a web bearer, Quality of Service Interactive, fallback 64/384:



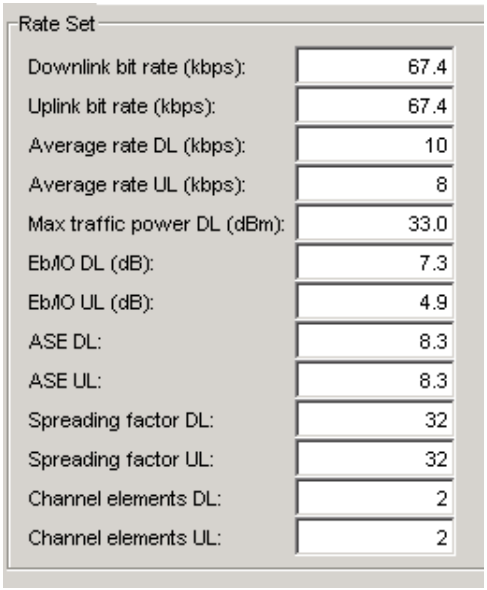
Example of Interactive Web Bearer 64/128 Rate Set

The following example shows a rate set for a web bearer, Quality of Service Interactive, fallback 64/128:



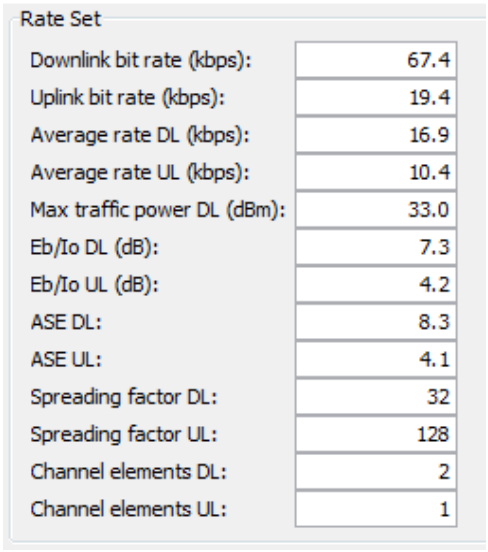
Example of Interactive Web Bearer 64/64 Rate Set

The following example shows a rate set for a web bearer, Quality of Service Interactive, fallback 64/64:



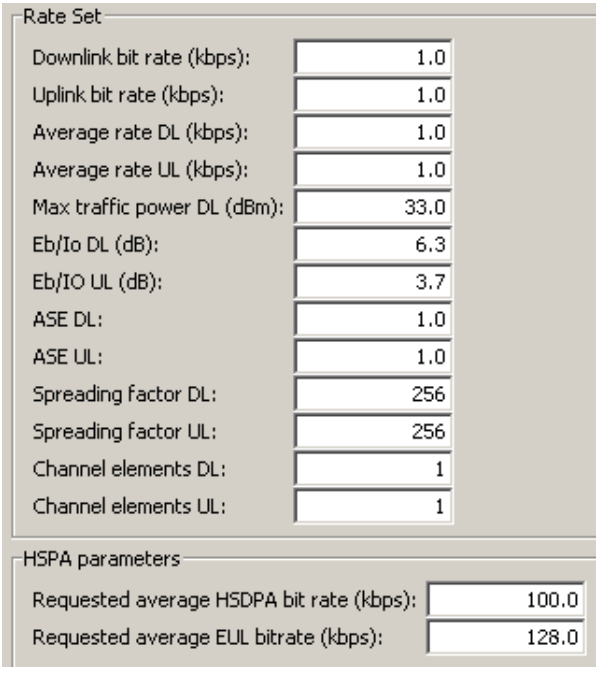
Example of Interactive Web Bearer 16/64 Rate Set

The following example shows a rate set for a web bearer, Quality of Service Interactive, fallback 16/64:



Example of HSUPA/EUL Bearer Rate Set

The following example shows a rate set for an HSUPA/EUL bearer, Quality of Service Streaming:



Define Bearers to Model Adaptive Multi Rate Speech

As an alternative to using the Adaptive Multi Rate (AMR) speech radio bearer of 12.2 kbps rate, use this procedure to define four AMR rate sets. You can model a variety of AMR data rates by defining WCDMA bearers especially for AMR and use these bearers in Monte Carlo simulation and plot generation.

Modeling AMR Speech

You can create four rate sets for the AMR radio bearer to model the four downlink and uplink data rates of the AMR service.

The table below provides initial parameter settings for modeling an AMR speech radio bearer with four rate sets. The AMR speech data rates are 4.75, 5.9, 7.95 and 12.2 kbps, and 3.4 kbps for the signaling radio bearer added to each speech bit rate.

	Rate Set Number			
Parameter	**1**	**2**	**3**	**4**
DL bit rate (kbps)	8.15	9.3	11.35	15.6
UL bit rate (kbps)	8.15	9.3	11.35	15.6
Average rate DL (kbps)	4.0	4.6	5.6	7.7
Average rate UL (kbps)	5.5	6.1	7.1	9.2
Max traffic power DL (dB relative to PCPICH)	+0.0	+0.0	+0.0	+0.0
Eb/Io DL (dB)	8.6	8.3	8.0	7.4
Eb/Io UL (dB)	6.4	6.3	6.0	5.5
ASE DL	1.0	1.1	1.26	1.61
ASE UL	1.0	1.1	1.26	1.61
Spreading factor DL	256	256	128	128
Spreading factor UL	128	64	64	64
Channel elements DL	1	1	1	1
Channel elements UL	1	1	1	1

To see the results of the simulation of AMR speech traffic, display the downlink or uplink traffic channel coverage (bit-rate) plot for the AMR radio bearer.

Define Traffic Demand Mix

Traffic demand defines the geographical distribution of offered traffic in a WCDMA project plan.

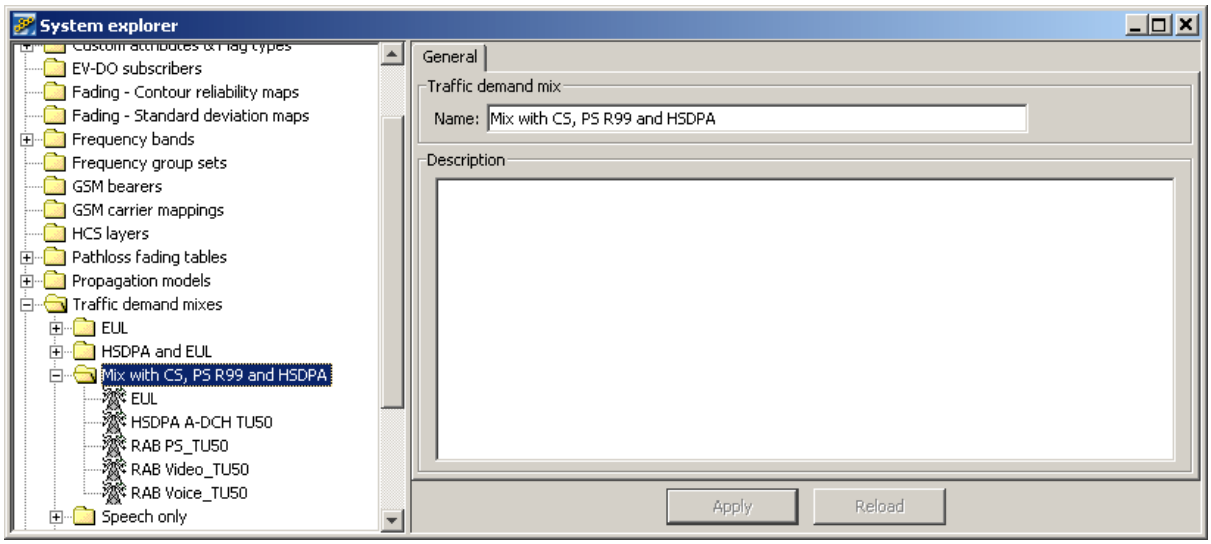
Define Traffic Demand Mix

Use a traffic demand mix to combine several types of mobile traffic in one group to apply to a project.

Use this procedure to define a traffic demand mix for a project.

Window to Use

Use the **Traffic Demand Mix - General** window to define traffic demand mixes:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the traffic demand mix. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Description	Description of the traffic demand mix.

Procedure

Follow these steps to define traffic demand mixes:

1. Select **Utilities↗System Explorer.**

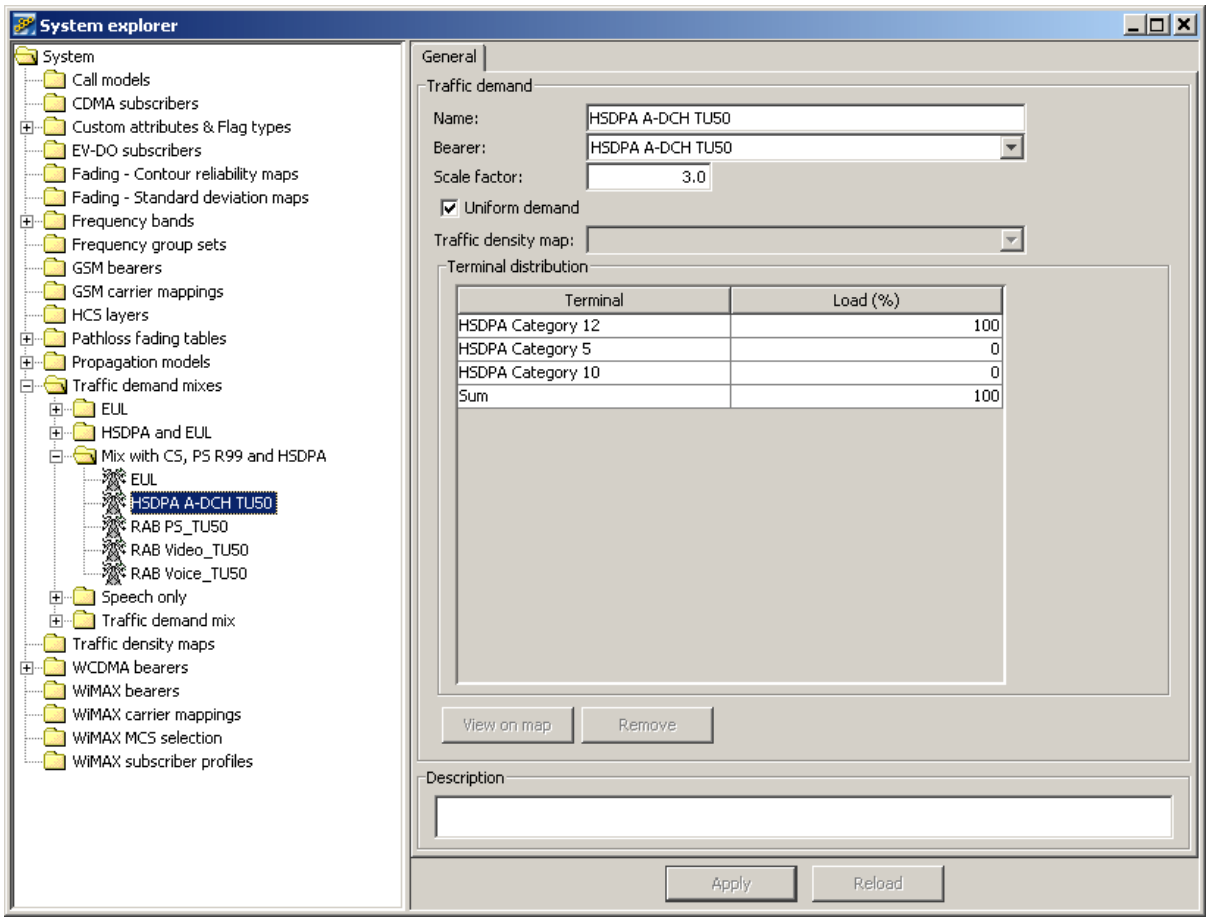
2. Right-click the **Traffic demand mix folder** and select **Add Traffic demand mix**. The **Traffic demand mix - General** window appears.
3. Add or change the name and description as required, and click **Apply** to preserve the traffic demand mix.

Define Traffic Demand

Use this procedure to define the traffic demand to use in traffic demand mixes.

Window to Use

Use the **Traffic Demand - General** window to add traffic demand to a network plan:



Fields in the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the traffic demand. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Bearer	The bearer for the traffic demand.

Field	Description
Scale factor	For uniform demand, set the scale factor equal to the traffic density (E/km^2 or kbps/km^2) With a traffic density map, the scale factor (Erlang or kbps) is multiplied with the value in 1/km^2 for every bin.
Uniform demand	Selects uniform traffic demand. Using this option, you cannot select a traffic density map.
Traffic density map	Traffic density map to use with this traffic demand. Using this option, you cannot select uniform demand.
Terminal distribution	The distribution of terminal types in the traffic demand. The total must equal 100%.
View on map	Displays the terminal distribution in the map display
Update	Updates the terminal distribution
Remove	Deletes a terminal from the distribution
Description	Description of the traffic demand.

Procedure

Follow these steps to add traffic demand:

1. Select Utilities↗System explorer.
2. Right-click the Traffic Demand folder, and select Add Traffic demand from the menu. The Traffic demand - General window is displayed.
3. Enter the traffic demand name.
4. Select the bearer for the traffic demand from the list of defined bearers.
5. Set Scale factor to a suitable value, for example to 1 (corresponding to 1 E/km2).
6. Check Uniform demand if applicable. If you select this option, you cannot select a traffic density map.
7. Define a Terminal distribution. The percentages of the terminals must add up to 100%.
8. Click Apply.
9. Repeat the procedure to create other traffic demands.

Define Traffic Density Maps

Use this procedure to define traffic density maps for projects. A traffic density map includes a mix of bearers or services. For each bearer or service and terminal included in the traffic density map, you must define a land use category.

Prerequisites

Before you create a traffic density map, you must define at least one bearer and one terminal type for the project.

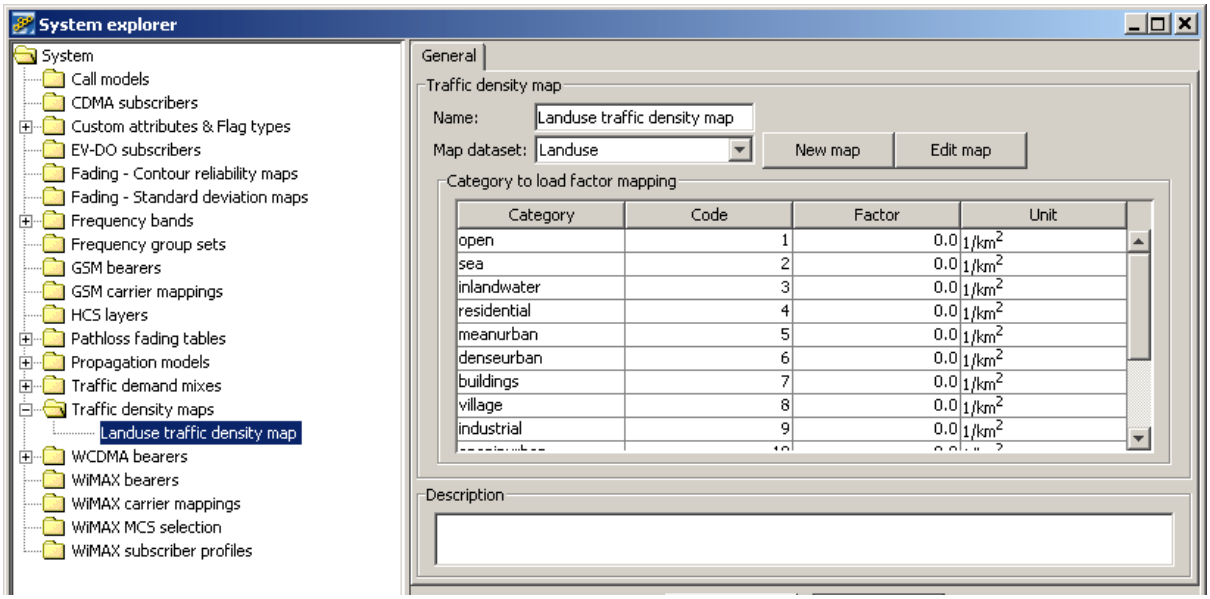
Traffic Density Factor

A traffic density map contains traffic density information for each land use category. The following density factors apply to types of traffic:

Type of Traffic	Density Factor
GSM circuit switched (CS) traffic	Erlangs/km2
GSM packet switched (PS) traffic	kbps/km2
WCDMA, both circuit switched and packet switched traffic	Number of subscribers/km2

Window to Use

Use the **Traffic density map - General** window to define traffic density maps:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the traffic density map. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Map database	Name of the map database to use with the traffic density map
New map	Selects a new map database to use with the traffic density map
Edit map	Starts the map editor to edit the currently selected map database
Category to load factor mapping	Categories to adjust the load factor mapping of the traffic density map. The categories are sorted by code number and may have different factor weights and use different units of measurement.
Description	Description of the traffic density map.

Procedure

Follow these steps to define traffic density maps:

1. Select Utilities↗System explorer.
2. Right-click the Traffic density maps folder and select Add Traffic Density Map from the menu. The Select a Map database window is displayed.
3. Select and map database and click OK. The Traffic density map - General window is displayed.
4. Add or change information as required, and click Apply to preserve the traffic density map.

About the Template Explorer

Use the Template explorer to manage templates for a WCDMA network plan. You can add, modify, or delete templates using the right mouse button menus.

Using templates is more efficient for planning large networks where many sites share the same types of equipment and systems.

Templates vs Instances

Template windows are almost always exact duplicates of windows in other explorers. For detailed explanations of template fields, see the corresponding descriptions of those elements in other explorers.

Define Equipment and Systems First

For easier template definition, define equipment and system types first, since most templates use pre-defined types. Use the Equipment explorer to define equipment types before defining the templates.

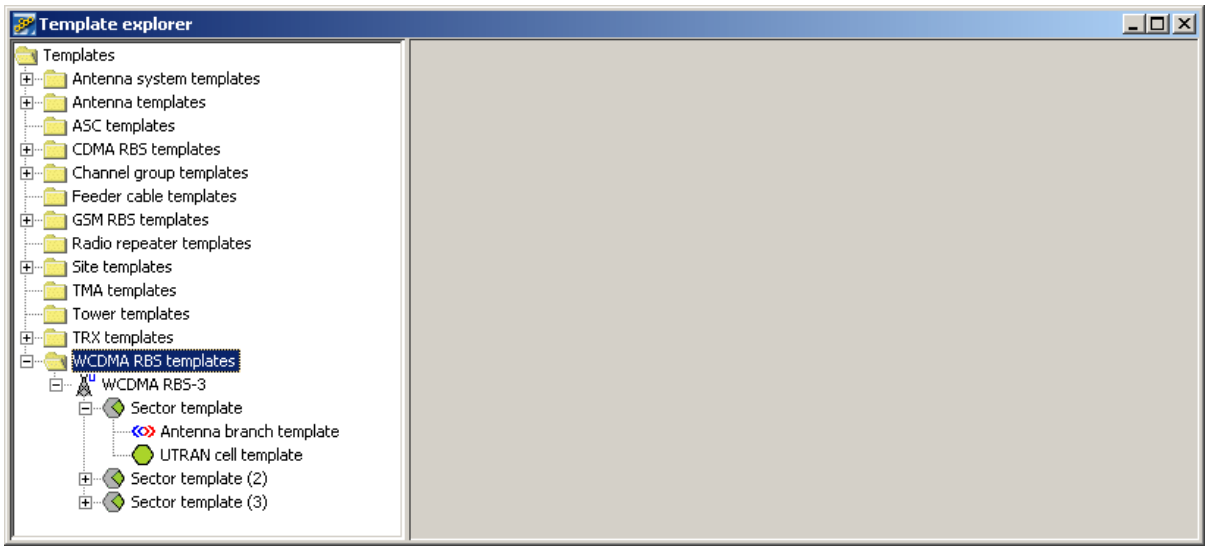
Pathloss Parameters Required in Templates

To calculate pathloss from template data, you must enter the minimum required parameters when you define templates as follows:

- Antenna height above ground level, in meters (antenna template)
- Antenna type (antenna template)
- Antenna azimuth, in degree from true North (antenna template)
- EIRP (effective isotropic radiated power (dBi)) or ERP (effective radiated power (dBd)) (antenna branch template)
- Pilot channel power PCPICH (antenna branch template)

Template Explorer Window

The following example of the **Template explorer** shows the WCDMA-specific templates managed with the explorer:



Select **Utilities↗Template explorer** to start the explorer.

Available WCDMA Templates

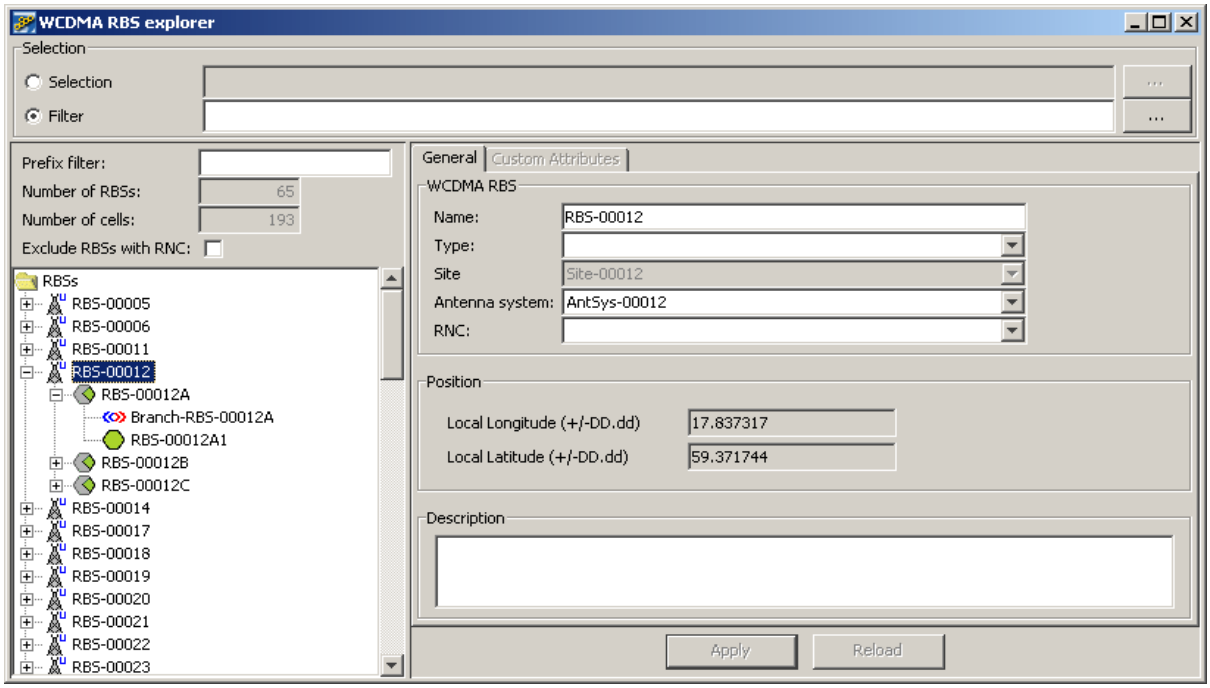
You can define the following WCDMA templates using the **Template explorer**:

Template	Represents
WCDMA site	Site configurations for WCDMA bearers
WCDMA RBS	Standard configurations for WCDMA RBS types
WCDMA sector	Standard configurations for cell sectors
WCDMA antenna branch	Standard configurations of antenna branches
WCDMA UTRAN cell	Standard configurations of UTRAN cells

Procedures for defining other templates are described in the *TEMS CellPlanner Common Features User's Guide*.

About the WCDMA RBS Explorer

Use the **WCDMA RBS explorer** to work with elements of the RBS without requiring it to have a relationship to a radio network controller (RNC). In TEMS CellPlanner, sectors, antenna branches, and cells are subelements of the RBS. You can add RBSs, add and change RBS sectors, connect antenna branches, and add cells to an RBS. Each object in the WCDMA RBS hierarchy has a menu accessible with the right mouse button.



Select **Utilities↗WCDMA RBS explorer** to start the explorer.

Fields on the WCDMA RBS Explorer Window

Initially, the WCDMA RBS explorer displays all RBSs in the network plan. Using filters on the **WCDMA RBS explorer**, you can limit the number and kind of RBSs displayed in the window.

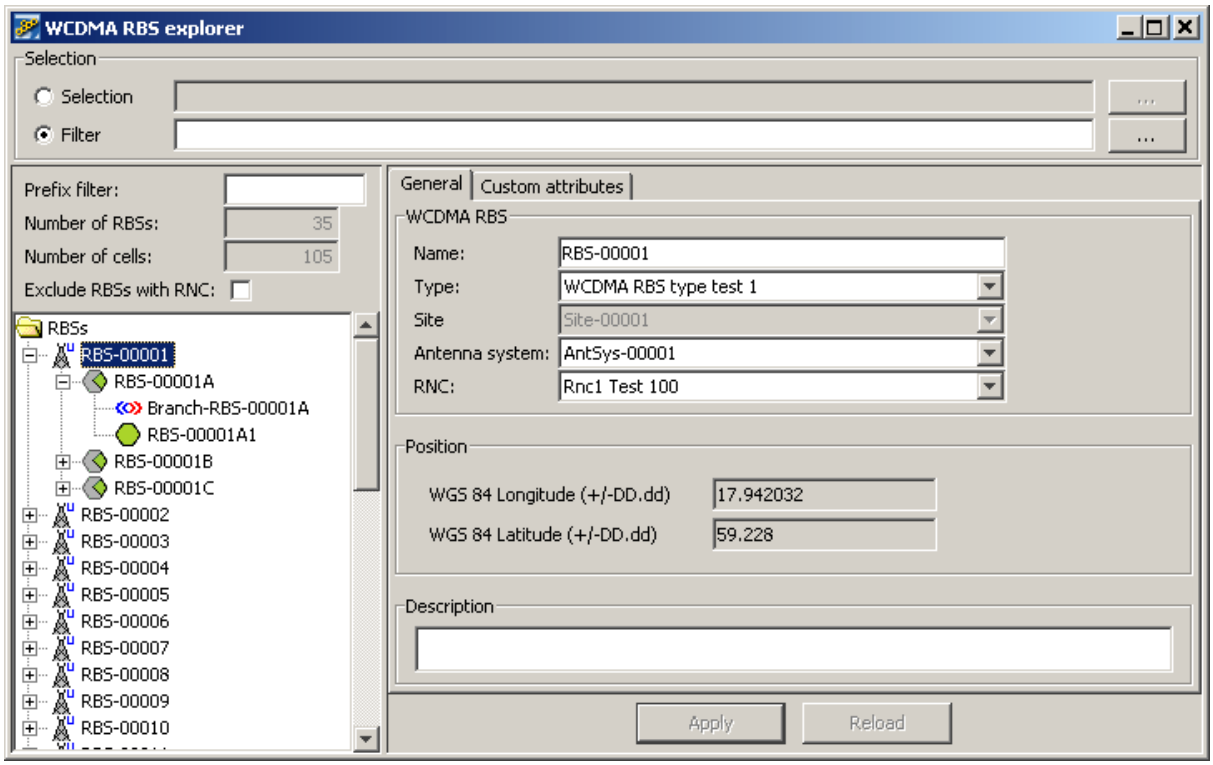
Field	Description
Prefix filter	Filters out RBSs whose names contain the exact numbers and characters of the RBS IDs entered.
Number of RBSs	Total RBSs displayed in the view
Number of cells	Number of cells associated with the RBSs
Exclude RBSs with RNC	Excludes RBSs with associated RNCs

Add WCDMA RBS General Information

Use this procedure to add WCDMA RBSs to a network plan.

Window to Use

Use the **WCDMA RBS - General** window to add general WCDMA RBS information:



Fields on the Window

The following table describes the fields on the window:

Fields	Description
Name	The name for the RBS. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Type	The RBS type defined in the Equipment explorer
Site	The site associated with the RBS.
Antenna system	Antenna system used at the site.
RNC	Radio Network Controller associated with the RBS.
Global Position	Longitude and latitude values for the RBS position.
Description	Description of the RBS.

Procedure

Follow these steps to add WCDMA RBSs to a network plan:

1. Select Utilities↗WCDMA RBS explorer.
2. Right-click the RBS folder, and select Add WCDMA RBS. The Select a Site window is displayed.
3. Select the site to which you want to add the RBS and click OK. The Select an Antenna System window is displayed.
4. Select an antenna system for the RBS and click OK. The WCDMA RBS - General window is displayed.
5. Enter information in the fields as applicable, and click Apply to preserve the RBS information.

Add Sectors to WCDMA RBSs

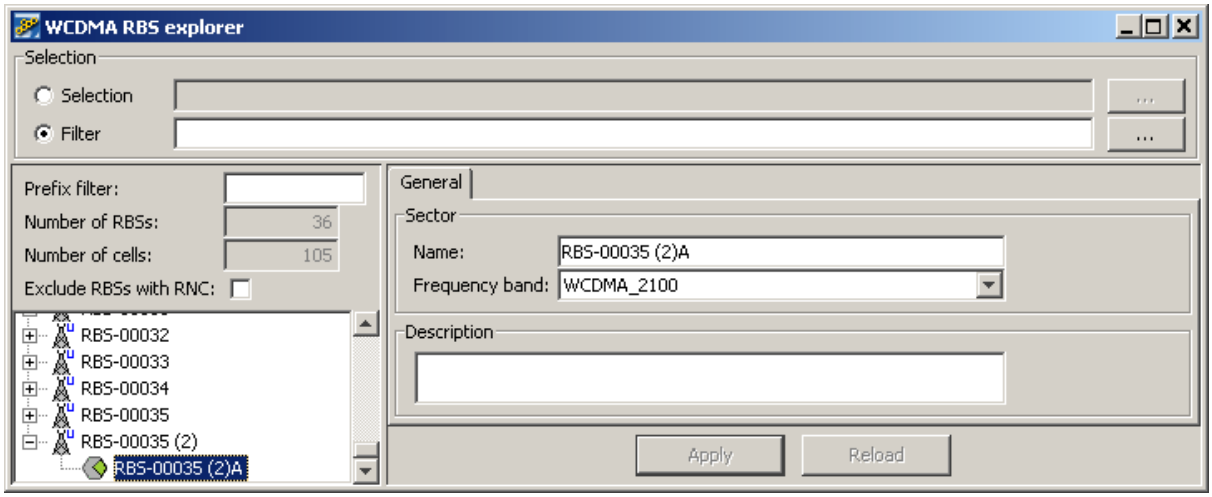
You must define sectors for WCDMA RBSs before you can add cells and antenna branches.

Maximum Sectors and Cells

Each WCDMA RBS may have up to eight sectors. Each sector may have up to four UTRAN cells associated with it.

Window to Use

Use the WCDMA RBS Sector - General window to add a sector to a WCDMA RBS.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name for the sector. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Frequency band	Frequency band for the sector
Description	Description of the sector

Procedure

Follow these steps to add sectors to WCDMA RBSs:

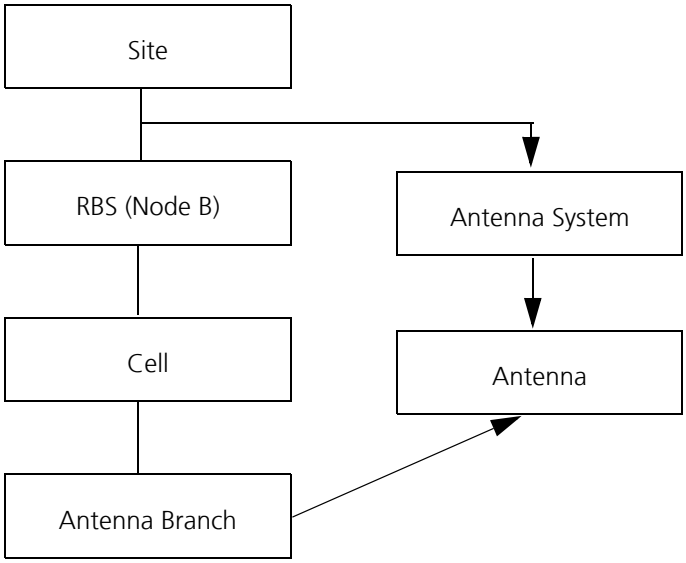
1. Select **Utilities↗WCDMA RBS explorer**.
2. Right-click a WCDMA RBS and select **Add Sector** from the menu.
3. Enter information in the fields as applicable. Click **Apply** to preserve the information.

Add Antenna Branches to WCDMA RBSs

Use this procedure to add antenna branches to WCDMA RBSs.

Relationship of Antennas to the Network

The illustration below shows the relationship of the antenna system to the RBS and the site within a network.



Enter the antenna branch information in two windows, one for general information and the other for specific antenna type information.

Add General Antenna Branch Information

Use this procedure to add antenna branch information.

Antenna Branch Reference Points

Reference point options are:

- Reference point A at the antenna connector Rx input
- Reference point B, the RF power output on top of the RBS cabinet

The Rx reference point is the point for which the power values used in WCDMA analysis are calculated.

Tx Reference Point

The Tx reference point in TEMS CellPlanner is always set to reference point B, the antenna output connector of the Tx branch on top of the RBS cabinet. Site specific Tx losses due to antenna feeders and couplers are considered.

ASC Type Parameters

Use Utilities↗Equipment explorer↗ASC types to enter the initial values for antenna system controllers. These values may need to be updated later.

Parameter	Unit	Range	Starting Value
Max. UL comp.	dB	0 to 15	6
DL loss	dB	0 to 15	0.2
Noise figure	dB	0 to 15	2.3

The noise figure of the cell is updated with the ASC noise figure, if you use an ASC in the antenna branch.

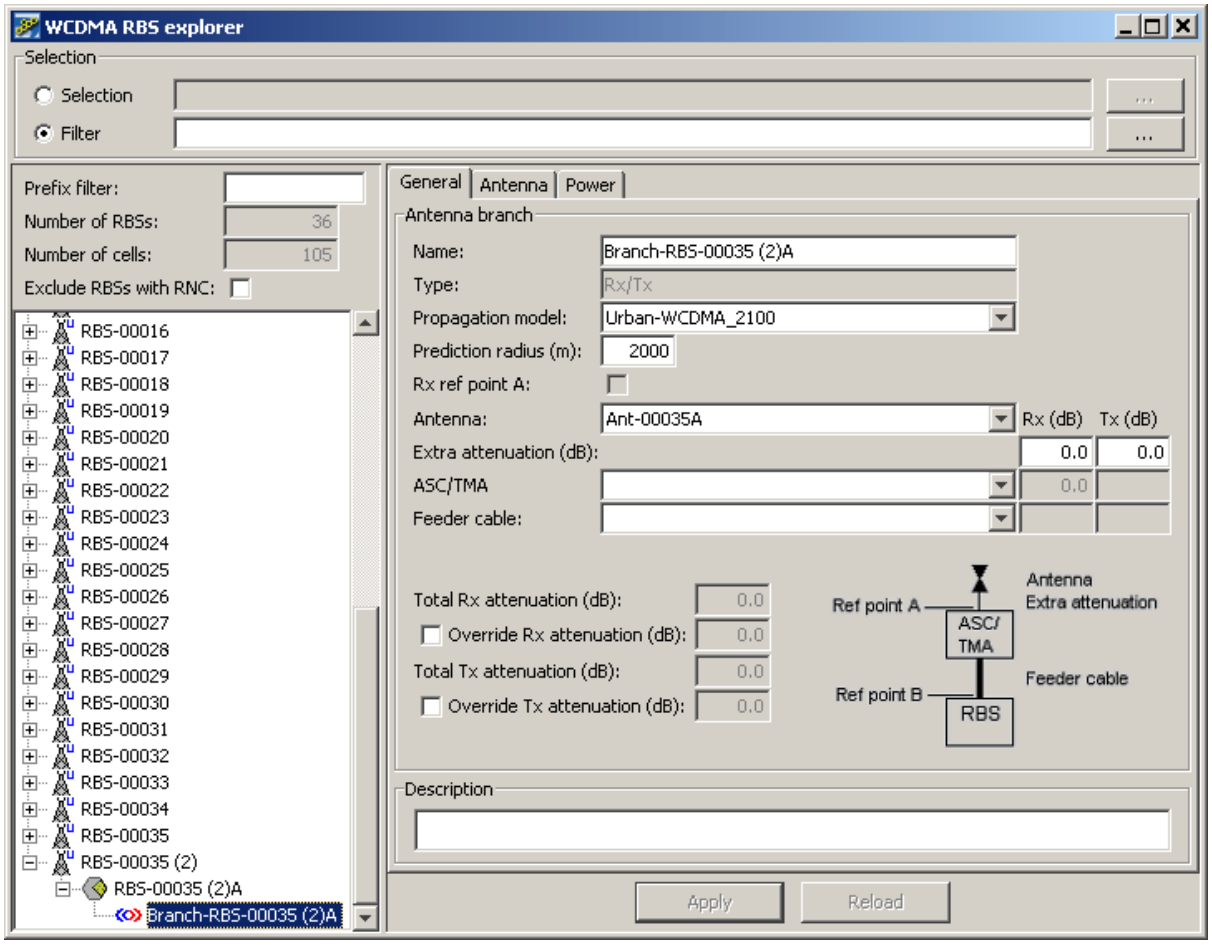
TMA Type Parameters

Use Utilities↗Equipment explorer↗TMA types to enter the initial values for tower mounted amplifiers. These values may need to be updated later. The value depends on the actual TMA equipment used. Consult the equipment manufacturer for details.

Parameter	Unit	Range	Initial value
Max. UL comp.	dB	0 to 15	3 - 5 dB
DL loss	dB	0 to 15	0.2
Noise figure	dB	0 to 15	3

Window to Use

Use the Antenna Branch - General window to add an antenna branch to a WCDMA RBS.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the antenna branch. Field length: Maximum 128 characters and numbers. Do not use /,\,',% Maximum of two branches per cell. At least one branch must be Tx or Rx/Tx. If the first branch is defined as Rx/Tx the second branch can be only an Rx branch. The second antenna branch in a sector must have the same value as the first. Initial value = A.
Type	Type of transmission of the antenna branch: • Rx • Tx • Rx/Tx Initial value = Rx/Tx
Propagation model	Propagation model used for the antenna branch. This propagation model is used for pathloss predictions.
Prediction radius (m)	Prediction radius in meters of the cell. Range: 0 - 200000. Initial value = 2000.
Rx ref point A	The reference point for the RX path of a cell is the point for which the power values used in WCDMA analysis are calculated, as shown in the diagram in the window. Options are: • reference point A (at the antenna connector Rx input • reference point B (the RF power output on top of the RBS cabinet) When selected, indicates the antenna branch uses reference point A as the Integration reference point of the antenna branch. For Ericsson UTRAN equipment reference point A is the standard system reference point to be used for WCDMA RAN P2.1 and onwards. The Tx reference point in TEMS CellPlanner is always set to the antenna output connector of the Tx branch on top of the RBS cabinet. Site specific Tx losses due to antenna feeders and couplers are considered. To use reference point B, make sure that Rx ref point A is not selected.
Antenna	Type of antenna for the antenna branch

Field	Description
Extra attenuation (dB)	Extra attenuation calculated when defining the total attenuation of the antenna branch for uplink (Rx) and downlink (Tx). The extra loss value in decibels is added to the total for receiving and transmitting. Range: 0 - 50. Initial value = 0.
ASC/TMA	Antenna system controller (ASC)/Tower mounted amplifier (TMA) type used with the antenna branch
Feeder cable	Feeder cable type used with the antenna branch
Total Rx attenuation (dB)	Total RX attenuation in decibels to override the calculated value. Range: 0 - 100. Initial value = 0.
Override Rx attenuation	Amount in decibels to override the calculated RX attenuation. Range: 0 - 100. Initial value = 0.
Total Tx attenuation (dB)	Total Tx attenuation in decibels to override the calculated value. Range: 0 - 100. Initial value = 0.
Override Tx attenuation	Amount in decibels to override the calculated TX attenuation. Range: 0 - 100. Initial value = 0.
Description	Description of the antenna branch

Procedure

Follow these steps to add antenna branch information to a WCDMA RBS:

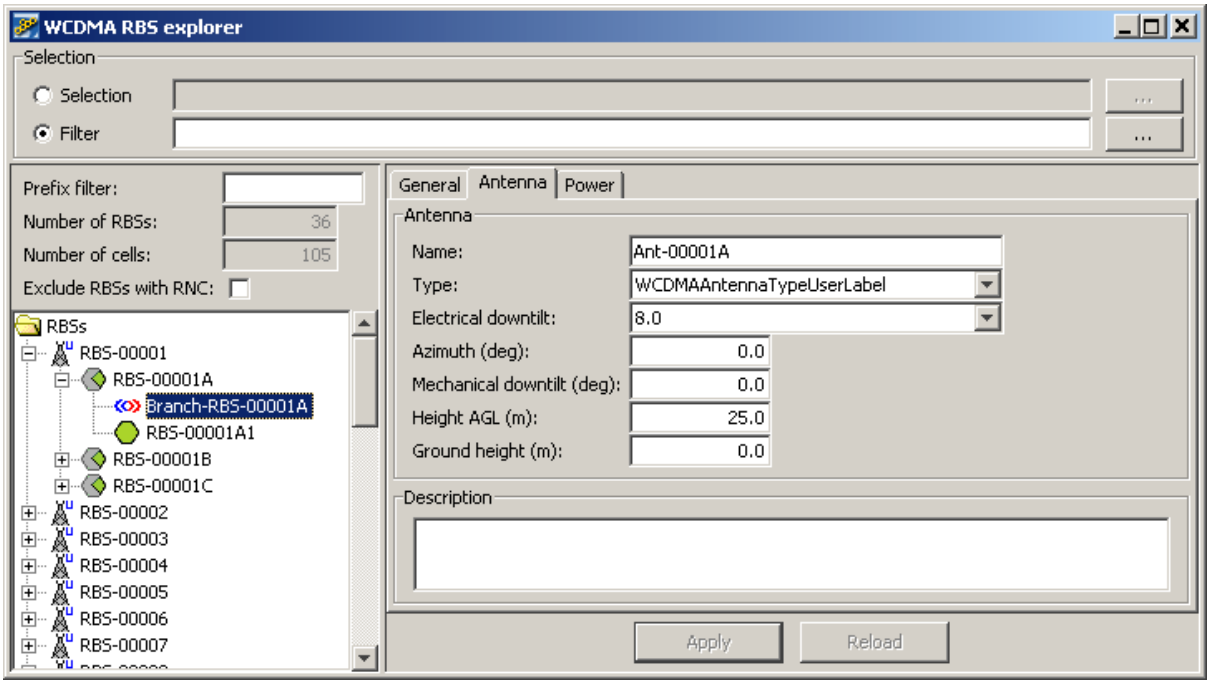
1. Select Utilities↗WCDMA RBS explorer.
2. Right-click a sector, and select Add Antenna branch. The Select an Antenna window appears, listing available antenna types.
3. Select an antenna for the antenna branch, and click OK. The Select antenna branch type window appears, listing available modes of operation: transmitting, receiving, or both.
4. Select an antenna branch type, and click OK. The Select a Propagation Model window is displayed.
5. Select a propagation model from the list, and click OK. The Antenna branch - General window appears.
6. Add or change data as required, and click Apply.

Add Antenna to Antenna Branch

Use this procedure to add an antenna type to an antenna branch.

Window to Use

Use the **Antenna branch - Antenna** window to enter a specific antenna type for the antenna branch:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the antenna used with the antenna branch. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Type	Type of antenna used with the antenna branch.
Electrical downtilt	The vertical tilt angle of the main antenna beam to the horizon, due to the electrical (remote) tilting of the antenna. Range: -90 to 90. Initial value = 0.0

Field	Description
Azimuth (deg)	The horizontal angle in which the main beam of the antenna is pointed. Defined clockwise in degrees starting from north (0). Common cell azimuths for a three-cell site with a 120 degree separation angle are 0 degrees, 120 degrees, and 240 degrees. Range: 0 - 360. Initial value = 0.
Mechanical downtilt (deg)	The vertical tilt angle of the main antenna beam to the horizon, due to the physical positioning of the antenna. The tilt angle is fixed and set when the antenna is mounted. Range: 0 to 90. Initial value = 0.
Height AGL (m)	The base station antenna height in meters above ground level (AGL). Range: 0 - 600. Initial value = 25 meters.
Ground height (m)	Antenna height in meters above the 0 (zero) level of the elevation map. If you set this to a value other than 0, you override the elevation map at this position. Range 0 - 600. Initial value = 0.0.
Description	Description of the antenna for the antenna branch

Procedure

Follow these steps to add antenna type information to a WCDMA RBS:

1. Right-click an antenna branch and select **Add antenna** from the menu. The **Antenna branch - General** window appears.
2. Click the **Antenna** window and add or change information in the fields as required.
3. Click **Apply** to preserve the information.

Add Power to Antenna Branch

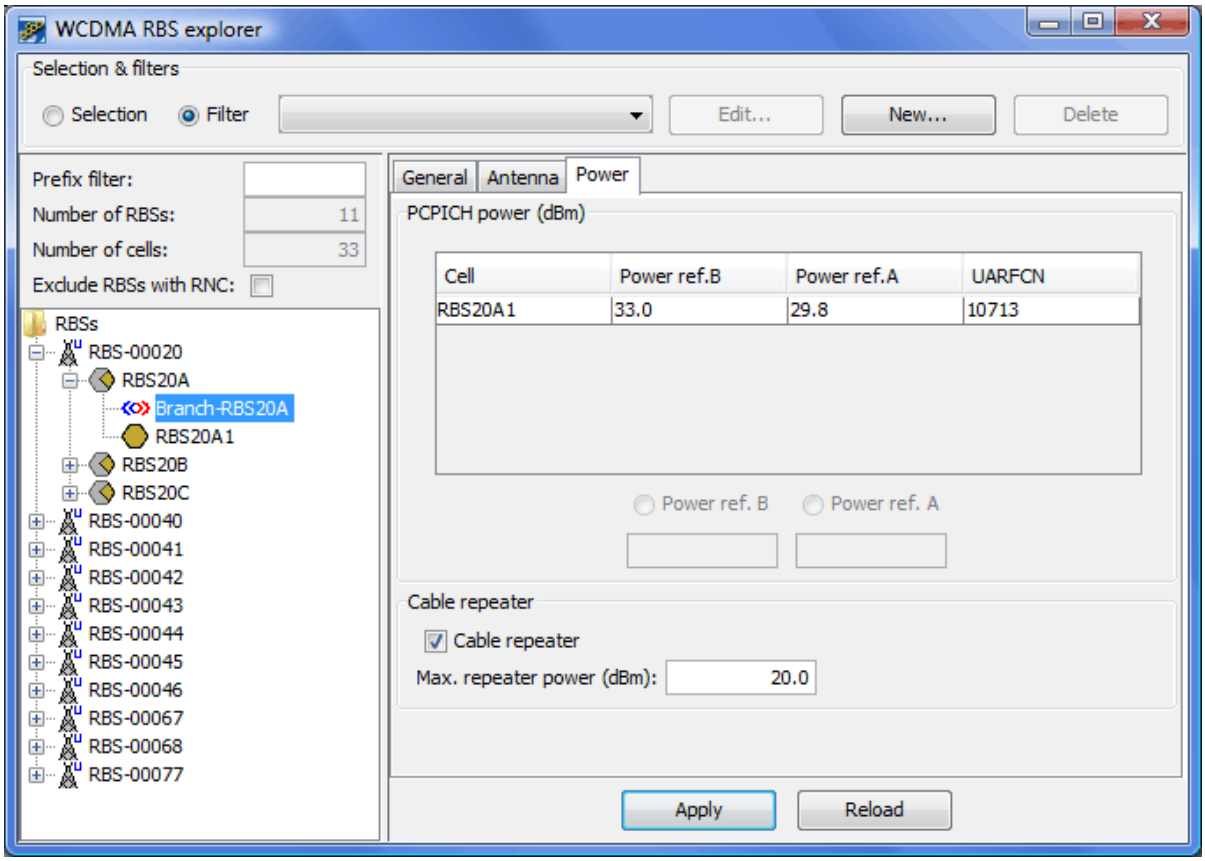
Use this procedure to add power settings to an antenna branch.

About Cable Repeaters

A cable repeater is connected to the antenna branch of a sector. The cable repeater serves all cells within the sector.

Window to Use

Use the Antenna branch - Power window to enter power for the antenna branch:



Fields on the Window

The following table describes the fields on the window:

Field	Description
PCPICH Power (dBm)	The PCPICH power in dBm for the cell carrier, including information for: • Cell ID • Power ref. B • Power ref. A • UARFCN This value is updated when you run the Optimize pilot power function.
Cable repeater	Indicates if the antenna branch uses a cable repeater. The radio channel number for the repeater is obtained from the selected cell information.
Max. repeater power (dBm)	Maximum cable repeater power in dBm for the antenna branch. The PCPICH power at ref point B and ref point A for the cable repeater are calculated based on the maximum power and the selected cell.
Description	Description of the antenna for the antenna branch

Procedure

Follow these steps to add power settings to a WCDMA RBS antenna branch:

1. Click the Power window and add or change information in the fields as required.
2. When you highlight the RBS in the PCPICH power window, the power for reference point A or B is displayed so you can change the power settings if required.

   If you change Max. power at repeater, PCPICH at ref. point B, or PCPICH at ref. point A, the other values are recalculated.
3. Click Apply to preserve the information.

Add UTRAN Cells to WCDMA RBSs

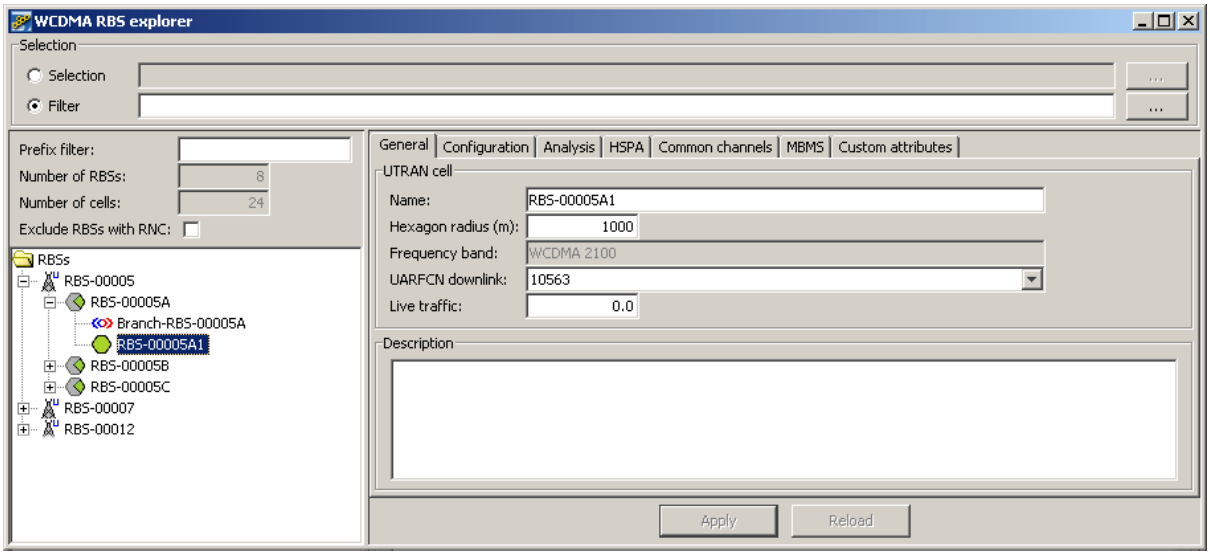
Use this procedure to add UTRAN cells sectors of WCDMA RBSs.

Assumptions for Initial Parameter Values

- All cell specific parameters in the following sections assume that *reference point A* is selected for antenna branches in the network.
- It is assumed that an ASC or TMA is installed in all antenna branches.
- The RF output power of all RBSs is assumed to be 20 Watts per cell.
- The maximum and minimum Tx power settings for the cells are set with regard to reference point B.

Window to Use

Use the **WCDMA RBS UTRAN Cell - General** window accessed from the **WCDMA RBS explorer** to enter basic UTRAN cell information for a WCDMA RBS. Information includes frequency band used with the cell.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the UTRAN cell. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Hexagon radius (m)	Radius in meters of the UTRAN cell hexagon for display for the cell in the Network layer.

Field	Description
Frequency band	Frequency band used by the UTRAN cell. Select from frequency bands defined for WCDMA.
UARFCN downlink	Downlink UMTS assigned radio frequency channel number (UARFCN) frequency used by the UTRAN cell
Live traffic	Live traffic in number of connected users. See WCDMA Live Traffic Distribution on 5-1 for more information.
Description	Description of the UTRAN cell

Procedure

Follow these steps to add UTRAN cells to WCDMA RBSs:

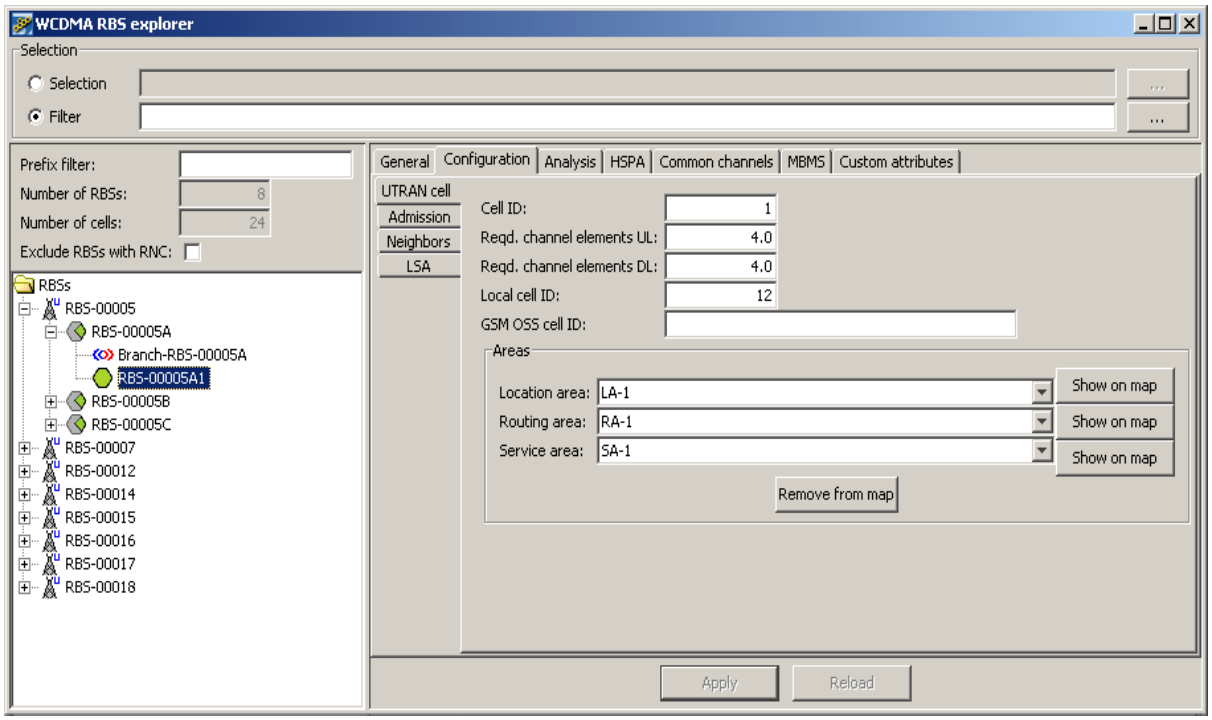
1. Select **Utilities↗WCDMA RBS explorer**.
2. Right-click a sector and select **Add Cell** from the menu. The **Select an Available carrier** window appears, listing available carriers. The carrier names in the list are a combination of the frequency band and the UARFCN radio channel.
3. Select a carrier, and click **OK**. The **UTRAN Cell - General** window appears.
4. Add or change information in the fields as required.
5. Click **Apply** to preserve the information.

Define UTRAN Cell Configuration Parameters

Use this procedure to set parameter values of a specific UTRAN cell.

Window to Use

Use the tabs available from the **UTRAN cell - Configuration** window to enter UTRAN cell configuration parameters.



Fields on the Window

The following table describes the fields on the **Configuration-UTRAN cell** tab:

Field	Description
Cell ID	Unique ID of a cell in one RNC. ID of the UTRAN cell (Relative Distinguished Name) in the RNC. Maximum 128 characters and numbers. Do not use /,\,',%. Initial value = RBS ID. Required by the RNC part of the GSM OSS-RC export and import.
Reqd. channel elements UL	Total channel elements required in the uplink for that cell, including channel elements for soft handover as calculated by WCDMA analysis.

Field	Description
Reqd. channel elements DL	Total channel elements required in the downlink for that cell, including channel elements for soft handover as calculated by WCDMA analysis.
Local cell ID	Unique ID of a cell in one RBS. Must be identical to Cell ID. Identifies resources in the RBS to support a cell. Required by the RBS part of the GSM OSS-RC export and import.
GSM OSS cell ID	Cell ID used for UTRAN neighbors in the GSM OSS system.
Location area	Location area associated with the cell.
Routing area	Routing area associated with the cell.
Service area	Service area associated with the cell.
Show on map	Displays the location, routing, and service areas on the map.
Remove from map	Removes the location, routing, and service areas from the map display.

Procedure

Follow these steps to enter UTRAN cell configuration parameters:

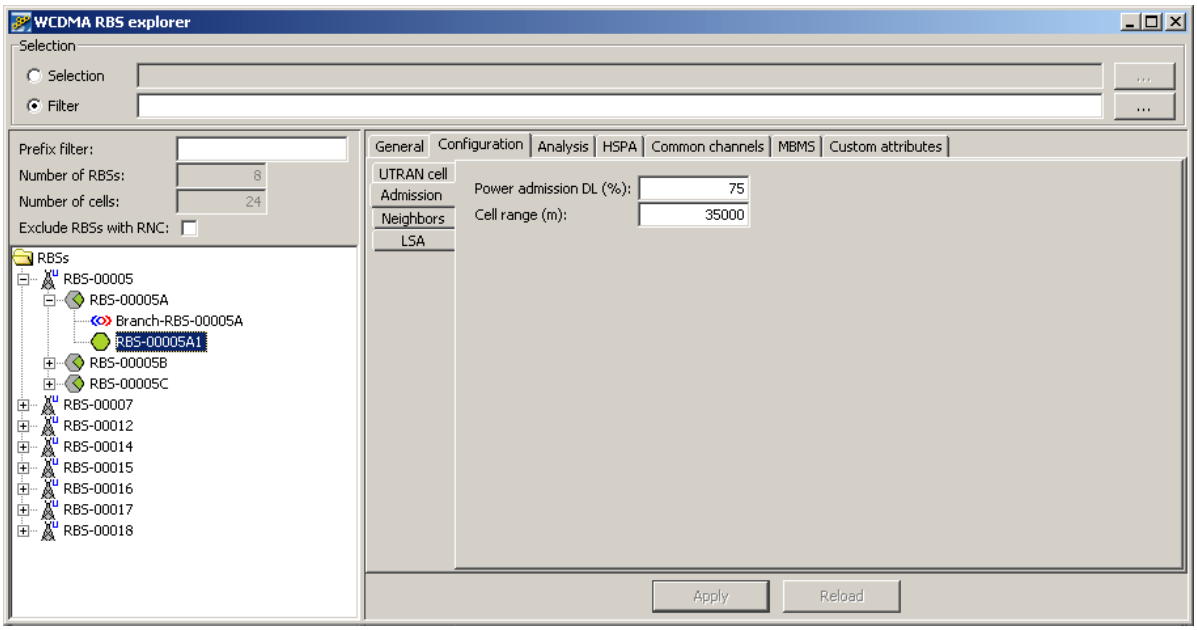
1. Select Utilities↗WCDMA RBS explorer.
2. Right-click a sector and select Add Cell from the menu. The Select an Available carrier window appears, listing available carriers.
3. Select a carrier, and click OK. The UTRAN Cell - General window appears.
4. Select the Configuration tab, and add or change information in the fields as required.
5. Click Apply to preserve the information.

Define UTRAN Cell Admission Parameters

Use this procedure to define admission control parameters for a UTRAN cell.

Window to Use

Use the UTRAN cell - Admission window to enter admission control parameters.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Power admission DL (%)	Admission limit percentage for admission on DL cell carrier power.
Cell range (m)	Maximum range for Random Access detection. Step size 250 meters. Range: 250 - 200000. Initial value = 35000.

Define UTRAN Cell Neighbor Relations

Chapter Neighbors in the *TEMS CellPlanner Common Features User's Guide* contains a more up-to-date description on how you can add, modify and delete neighbors. The descriptions below will be aligned in a later release.

Use this procedure to define individual UTRAN cell neighbor relations. Neighbor cell relations are used for scrambling code optimization, and are also used by the operations and maintenance system.

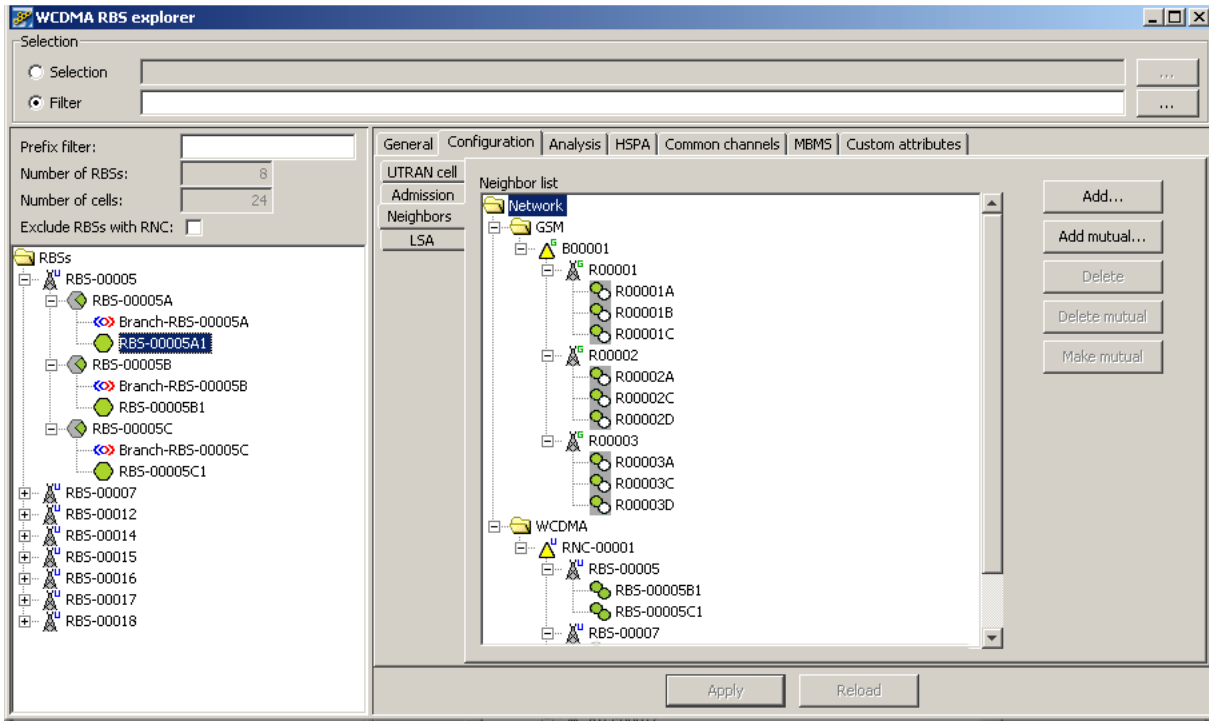
Adding and changing neighbor relations in this window updates the cell information in the project.

Prerequisites to Display Neighbor Relations

Load two network map layers, for example a WCDMA network layer and a GSM network layer. See the *TEMS CellPlanner Common Features User's Guide* for additional information on adding map layers.

Window to Use

Use WCDMA RBS explorer and select the UTRAN Cell - Neighbor window to add neighbor relations to cells.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Neighbor list	Shows the neighbors for a cell, organized by technology and then by RBS. Mutual cell relationships are displayed with a double green cell icon. Non-mutual relationships are displayed with a green/white cell icon. The list indicates when the relation is mutual, meaning that the origin cell is also included on the neighbor list of the target cell.
Add...	Displays the Cell selection (Add) window for adding neighbor cells to the highlighted cell. Makes the cell relationship non-mutual.
Add mutual...	Displays the Cell selection (Add mutual) window for adding a mutual cell neighbor relationship.
Delete	Deletes a neighbor relationship from a cell.
Delete mutual	Deletes a mutual relationship from the original cell and its neighbor.
Make mutual	Makes a cell relationship mutual between two cells.

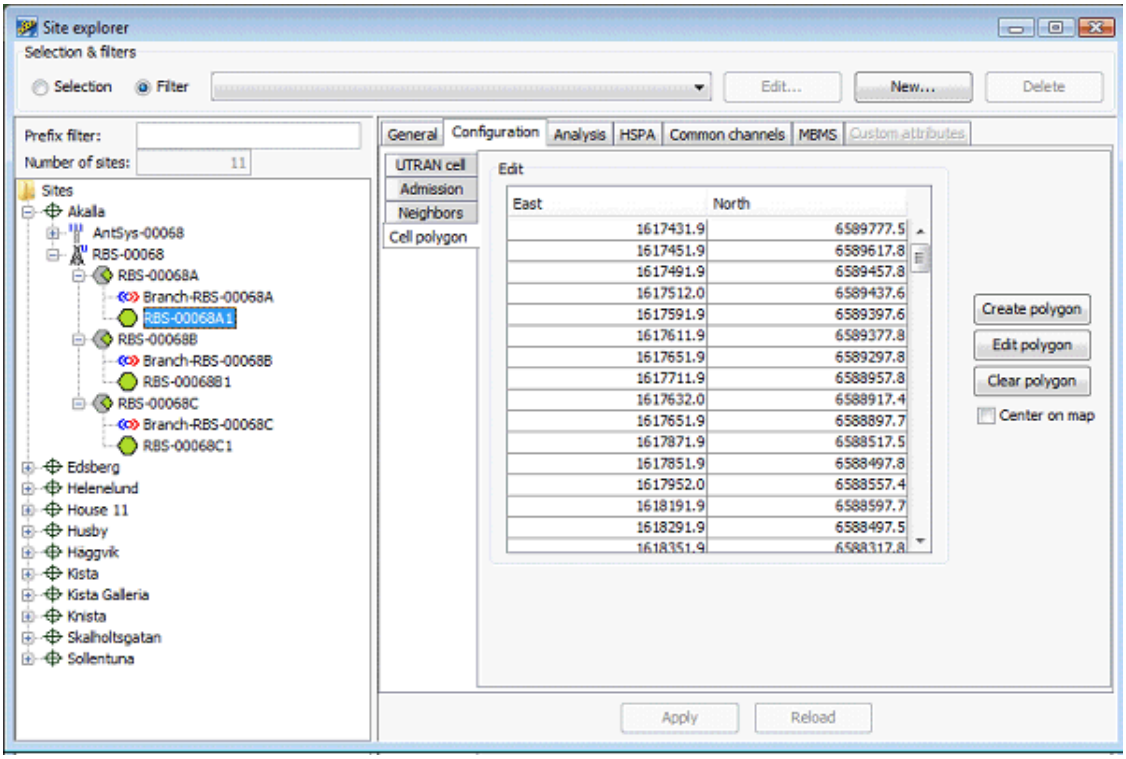
Define UTRAN Cell Polygon Parameters

UTRAN cell polygon parameters define the cell polygon configuration parameters for the UTRAN cell.

Cell polygons are generated based on the best server calculation results from the WCDMA analysis.

Window to Use

Use the **UTRAN cell - Cell polygon** window to add, edit or clear a cell polygon for the UTRAN cell.



Fields on the Window

The following table describes the fields on the window:

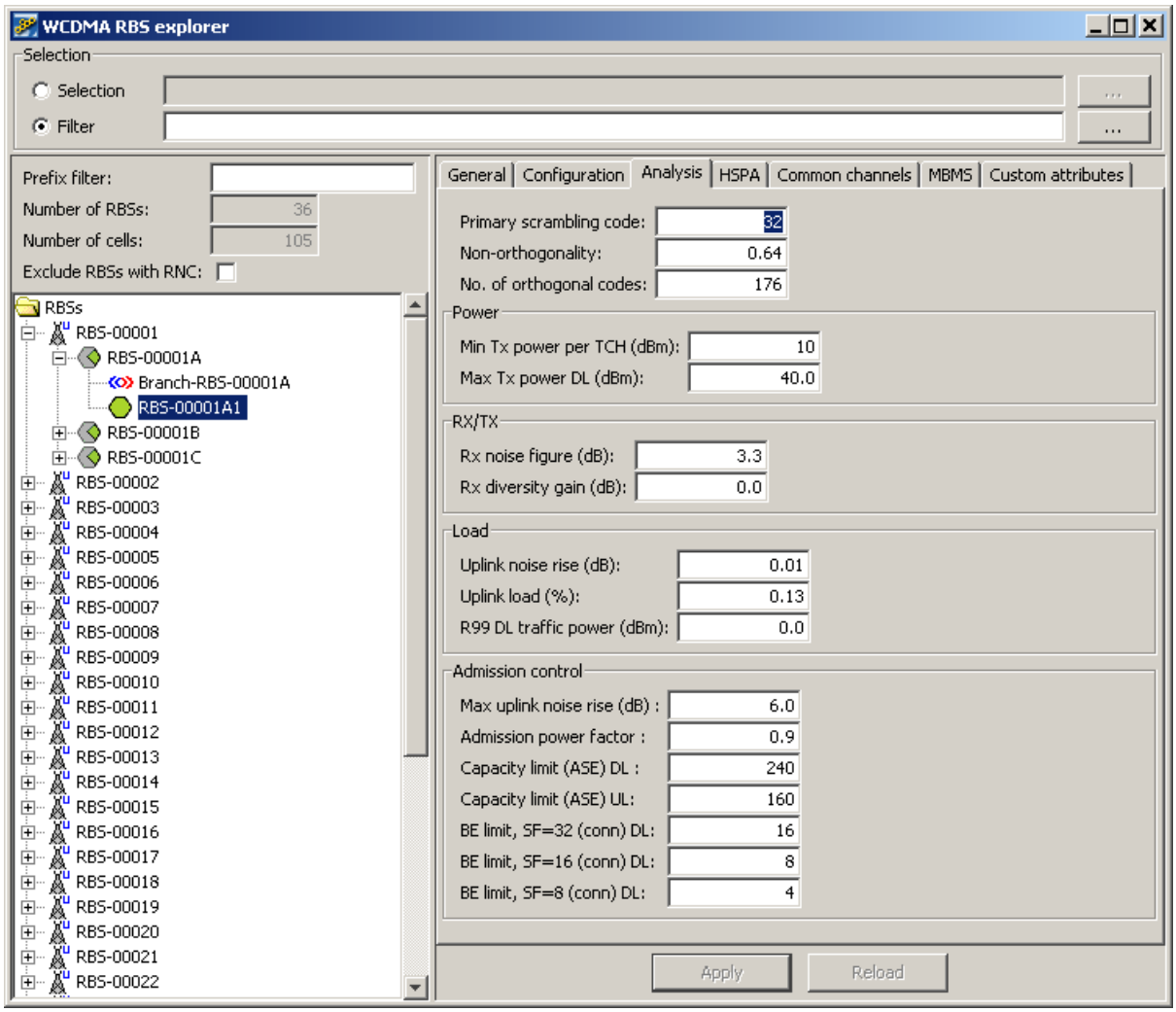
Field	Description
Edit	Edits the east and north positions in degrees of the cell polygon.
Create polygon	Populate (or replace) the table from the vertices of the polygon selected on the map. Requires you to create and select the polygon with the cell polygon tool.
Edit polygon	Displays the end points of the polygon so you can move them and reshape it.
Clear polygon	Clears the polygon display from the map window.
Center on map	Centers the polygons in the map display.

Define UTRAN Cell Analysis Parameters

UTRAN cell analysis parameters are used to calculate pathloss and in WCDMA analysis.

Window to Use

Use the **WCDMA RBS Cell - Analysis** window to enter UTRAN cell analysis parameters.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Primary scrambling code	The primary scrambling code used in the downlink. One code is assigned to each cell. The number is limited to 512 to prevent the cell search procedure from becoming excessive. Range: 0 - 512. When you optimize scrambling codes, this field is automatically filled.
Non-orthogonality	The amount of intra-cell interference generated due to time dispersion in the downlink. The interference is calculated by multiplying the total power of the cell (except synchronization channel power) by the non-orthogonality factor. Range: 0.00 - 1.00. • Initial value = 0.3 • Rural areas - 0.15 • Urban areas - 0.64
No. of orthogonal codes	Total orthogonal codes spreading factor codes available for non-HSDPA (R99 traffic and common channels) on the downlink. (Number of codes for HSDPA is configured in Define UTRAN Cell HSPA Parameters). WCDMA analysis ensures that no more than the maximum codes are required to serve subscribers trying to connect to a cell. If the subscribers exceed the limit, some users are disconnected randomly until the maximum codes specified can serve the connected subscribers. Range: 0 - 256. Initial value = 176.
Min Tx power per TCH (dBm)	Minimum transmit power that can be allocated to a traffic channel on the downlink, in dBm. Range: 0 - 50, Initial value = 6 dBm. The minimum Tx power per traffic channel should always be 20 dB below the CPICH power. Assuming a CPICH power of 33 dBm at reference point B gives the following result: **Min. Tx power per TCH** = P_{CPICH} - 20 dB = 33 dBm - 20 dB **= 13 dBm**
Max TX power DL (dBm)	Maximum total Tx power on downlink in dBm. Range: 0 - 50. Initial value = 43 dBm. **Max Tx power DL** = P_{RBS} - L_{feeder} - $L_{insertion\ TMA/ASC}$ = 43 dBm - 2.8 dB - 0.2 dB **Max Tx power DL = 43 dBm**.

Field	Description
Rx noise figure (dB)	Noise figure of the receiver in dB if TMA is used. Replaces RBS noise figure. The higher the noise figure, the higher is the background noise level for that receiver, and the lower quality of service provided. Range: 0 - 15. Initial value = 4 dB
Rx diversity gain (dB)	Gain added to the received signal due to spatial antenna diversity. The ratio of the signal field strength is obtained by diversity combining to the signal strength obtained by a single path. The signals received by the two Rx antennas experience different fading patterns, resulting in a diversity gain. Range: 0 - 10. Initial value = 0 dB The initial value assumes that the Rx diversity gain has been considered in the Eb/Io values for the WCDMA bearers, derived from link-level simulations. When the Eb/Io values do not consider the Rx diversity gain, you can enter a value of up to 3 dB.
Uplink noise rise (dB)	The upper limit on uplink noise rise. Range: 1 - 50 dB. An output parameter from iterative WCDMA analysis.
Uplink load (dB)	Uplink load calculated from uplink noise rise. Range: 0 - 100%. The uplink load is calculated from the uplink load = (1 -1/noise rise) and expressed in percent.
Total traffic power	Total downlink power dedicated to traffic channels. Range: 0 - 50 dBm. An output parameter from the iterative WCDMA analysis.
Max uplink noise rise	Maximum allowed uplink noise rise. Range: 1 - 20. Initial value = 6 dB.
Admission power factor	Factor used to compute admission power for the cell. Defines the amount of power used from the maximum output power of the cell. Example: A factor of 0.3 indicates that up to 30% of the maximum output power of the cell can be used for common and dedicated channels. Range: 0.00 - 1.00. Initial value = 0.9.
Capacity limit (ASE) DL	The upper limit on Air-interface Speech Equivalents (ASEs) in the downlink. Range: 0 - 500. Initial value = 240. The initial value is the WCDMA initial value for Ericsson equipment.
Capacity limit (ASE) UL	The upper limit on Air-interface Speech Equivalents (ASEs) in the uplink. Range: 0 - 500. Initial value = 160. The initial value is the WCDMA initial value for Ericsson equipment.
BE limit, SF=32 (conn) DL	Admission limit for best effort services using the spreading factor 32. Range: 0 - 32, Initial value = 32. The initial value is the WCDMA value for Ericsson equipment.

Field	Description
BE limit, SF=16 (conn) DL	Admission limit for best effort services using the spreading factor 16. Range: 0 - 16. Initial value = 16. The initial value is the WCDMA initial value for Ericsson equipment.
BE limit, SF=8 (conn) DL	Admission limit for best effort services using the spreading factor 8. Range: 0 - 8. Initial value = 8. The initial value is the WCDMA initial value for Ericsson equipment.

Procedure

Follow these steps to define UTRAN cell analysis parameters:

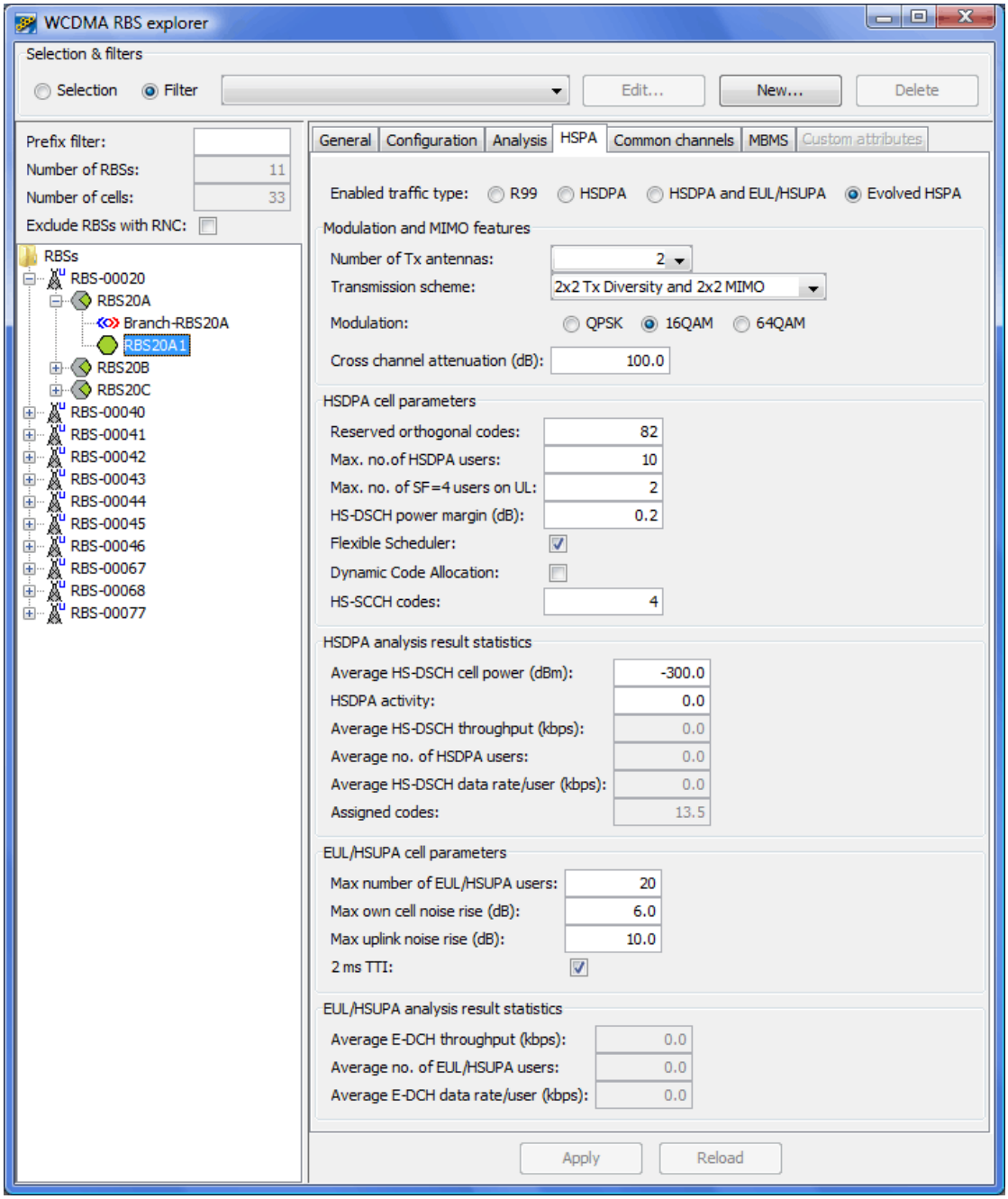
1. Select Utilities↗WCDMA RBS explorer.
2. Right-click a sector and select Add UTRAN Cell from the menu. The Select an available carrier window appears, listing available carriers.
3. Select a carrier, and click OK. The UTRAN Cell - General window appears.
4. Select the Analysis tab, and add or change information in the fields as required.
5. Click Apply to preserve the information.

Define UTRAN Cell HSPA Parameters

UTRAN cell HSPA parameters are required to use HSPA in a WCDMA network.

Window to Use

Use the **UTRAN Cell - HSPA** window to define HSPA parameters for the cell:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Enabled traffic type	Selects the traffic type allowed in the cell. Options: • R99 - R99 traffic only • HSDPA - R99 and HSDPA traffic • HSDPA and EUL/HSUPA - R99, HSDPA and EUL traffic • Evolved HSPA - HSPA traffic with increased throughput
Modulation and MIMO features	
Number of Tx antennas	• 1 = ordinary antenna (default) • 2 = 2x2 MIMO antenna and/or Tx diversity
Transmission scheme	Evolved HSPA transmission technique supported by this cell. • 1x2 MRC (only choice for 1 tx antenna, read-only) • 2x2 Tx diversity (possible choice for 2 tx antennas) • 2x2 Tx diversity and 2x2 MIMO (possible choice for 2 tx antennas, for cells capable of both transmission schemes)
Modulation	Downlink modulation scheme for HSPA enabled cell. Options: • QPSK (default) • 16QAM • 64QAM (The uplink modulation scheme is determined by selection of EUL terminal category).
Cross channel attenuation (dB)	The attenuation of interference between MIMO channels. Should be set to maximum value since the mapping curve takes this interference into account. Used for MIMO antennas only. Range: 0-100. Initial: 100 dB.
HSDPA cell parameters	

Field	Description
Reserved orthogonal codes	Defines the number of channelization codes reserved for the HSDPA channels HS-DSCH and HS-SCCH. The number of codes refers to 256 spreading factor codes. The amount of SF 256 code resources set here is automatically subtracted from the value for **No. of orthogonal codes** found on the **Analysis** tab for this cell. The total code resources per cell for both common channels, R99, and HSPA traffic cannot exceed 256 codes. A warning message is displayed when you attempt to allocate more resources than are available. Initial value: 80 Example: Assuming that HS-DSCH runs on five SF16 codes, and two SF256 codes are required per HS-SCCH channel, the total channelization codes allocated to HSPA are 82: 5 x SF16 = 80 SF256 codes + 1 x SF128 = 2 SF256 codes ===>Total: 82 SF256 codes ***Note:*** *Although the default value is 80 you should increase it to 82. The cell parameter* ***No. of orthogonal codes*** *shall then be assigned value 174 to maintain a total of 256 codes. See* Define UTRAN Cell Analysis Parameters *on page 3-58**.*
Max. no. of HSDPA users	Maximum HSDPA users allowed in the cell. Limits the maximum HSDPA users via admission control that can connect to the cell. Range: 1 - 100. Initial value = 16.
Max. no. of SF=4 users on UL	Maximum users with SF=4 on uplink allowed for the cell. Limits the users that require SF4 (spreading factor 4) on the uplink connection of the A-DCH (HS-DPCCH). Range: 0 - 1000. Initial value = 0.
HS-DSCH power margin (dB)	The higher value, the lower power allocated for HSDPA. Initial value = 0.2 dB.
Flexible Scheduler	Selects the Flexible Scheduler for the cell simulate code multiplexing. In order for a cell to be enabled for the Flexible Scheduler during Monte Carlo analysis, it must be enabled both in the cell and in the **WCDMA analysis-HSPA** window.
Dynamic Code Allocation	Enables dynamic code allocation for HSDPA. Dynamic Code Allocation maximizes the number of HS-DSCH codes that may be used by the Flexible Scheduler.
HS-SCCH codes	Number of HS-SCCH codes for HSDPA multiplexing to simulate HS-SCCH power control.
HSDPA analysis result statistics	

Field	Description
Average HS-DSCH cell power (dBm)	Average transmitted HSPA cell power in dBm. Contains statistical results from the simulation of HSPA users in the cell. Displays the average power in dBm allocated to the HS-DSCH during trials of Monte Carlo analysis. Power allocation depends on the parameter Power admission threshold, valid for R99 traffic and common channels, as well on the rate of serving or blocking users on the R99 traffic channels. This parameter is an output from Monte Carlo analysis. If you run non-iterative analysis, you must select this parameter to generate HSDPA related coverage plots. Initial value: 0 dB
HSDPA activity	Average time ratio when HSDPA is active in the cell.
Average HS-DSCH throughput (kbps)	Average achieved HSDPA data rate for cell in kbps. Displays the average bit rate in kbps achieved for the cell during Monte Carlo simulation. The value depends on the power allocated to HS-DSCH, the number and categories of HSDPA capable terminals served as well as on the position of these terminals in the network during the simulation (radio propagation conditions). This parameter is for information only.
Average no. of HSDPA users	Average HSPDA users over all trials served by the cell during Monte Carlo simulation. This value implies that these users have consumed HSDPA power resources and were connected on both the A-DCH and the HS-DSCH with one of the specified terminal categories. This parameter is a display parameter only.
Average HS-DSCH data rate/user (kbps)	Average achieved HSDPA data rate per user in kbps. Provides information on the achieved data rate in kbps for the served HSDPA users in the cell averaged over all trials of Monte Carlo simulation. This parameter is a display parameter only.
Assigned codes	Average number of assigned spreading factor codes for HSDPA. Calculated only if Dynamic code allocation selected.
EUL/HSUPA cell parameters	
Max number of EUL/HSUPA users	Maximum number of allowed EUL users for the cell. Range: 0 - 100. Initial value: 32.
Max own cell noise rise (dB)	Maximum allowed cell noise rise in dB from users power controlled by this cell. Range: 0 - 55. Initial value = 3. If modeling an Ericsson WCDMA system network, this parameter should have the same value as the system parameter eulMaxOwnUuLoad.
Max uplink noise rise (dB)	Upper limit on noise rise in dB. Range: 0 - 55. Initial value = 10. If modeling an Ericsson WCDMA system network, this parameter should have the same value as the system parameter eulMaxRotCoverage.

Field	Description
2 ms TTI	Option selected for cells supporting EUL with 2 ms TTI. A higher UL bit rate is obtained provided that the UEs also support 2 ms TTI. See *TEMS CellPlanner WCDMA Technical Reference Manual* for information on EUL terminal categories supporting 2 ms TTI. Initially unselected.
EUL/HSUPA analysis result statistics	
Average E-DCH throughput (kbps)	A guideline for the E-DCH rate set parameter settings must be supplied to the TCP users.
Average no. of EUL users	Average number of EUL users output from WCDMA analysis. For information only.
Average E-DCH data rate/user (kbps)	Average E-DCH data rate per user output from WCDMA analysis. For information only.

Procedure

Follow these steps to define UTRAN cell HSPA parameters:

1. Select Utilities↗WCDMA RBS explorer.
2. Right-click a sector and select Add UTRAN Cell from the menu. The Select an Available carrier window appears, listing available carriers.
3. Select a carrier, and click OK. The UTRAN Cell - General window appears.
4. Select the HSPA tab, and add or change information as required.
5. Click Apply to preserve the information.

Define UTRAN Cell Common Channels

Use this procedure to define common channels for UTRAN cells. UTRAN cell common channel parameters are used for optimizing pilot power.

Activity and Spreading Factors

For each channel, the common channels table shows the power value, activity factor, and spreading factor. The *activity factor* refers to the percentage of time a channel is active. For example, a channel with activity factor 0.1 is available 10% of the time.

Common Channel Parameters

Use **Utilities↗WCDMA RBS↗Cell↗Common channels** to enter the values for the cell specific parameters of a WCDMA RBS.

The power setting for the CPICH is an important parameter for the coverage calculations in WCDMA analysis. As a general rule the maximum power setting of the CPICH should not exceed 10% of the total cell output power.

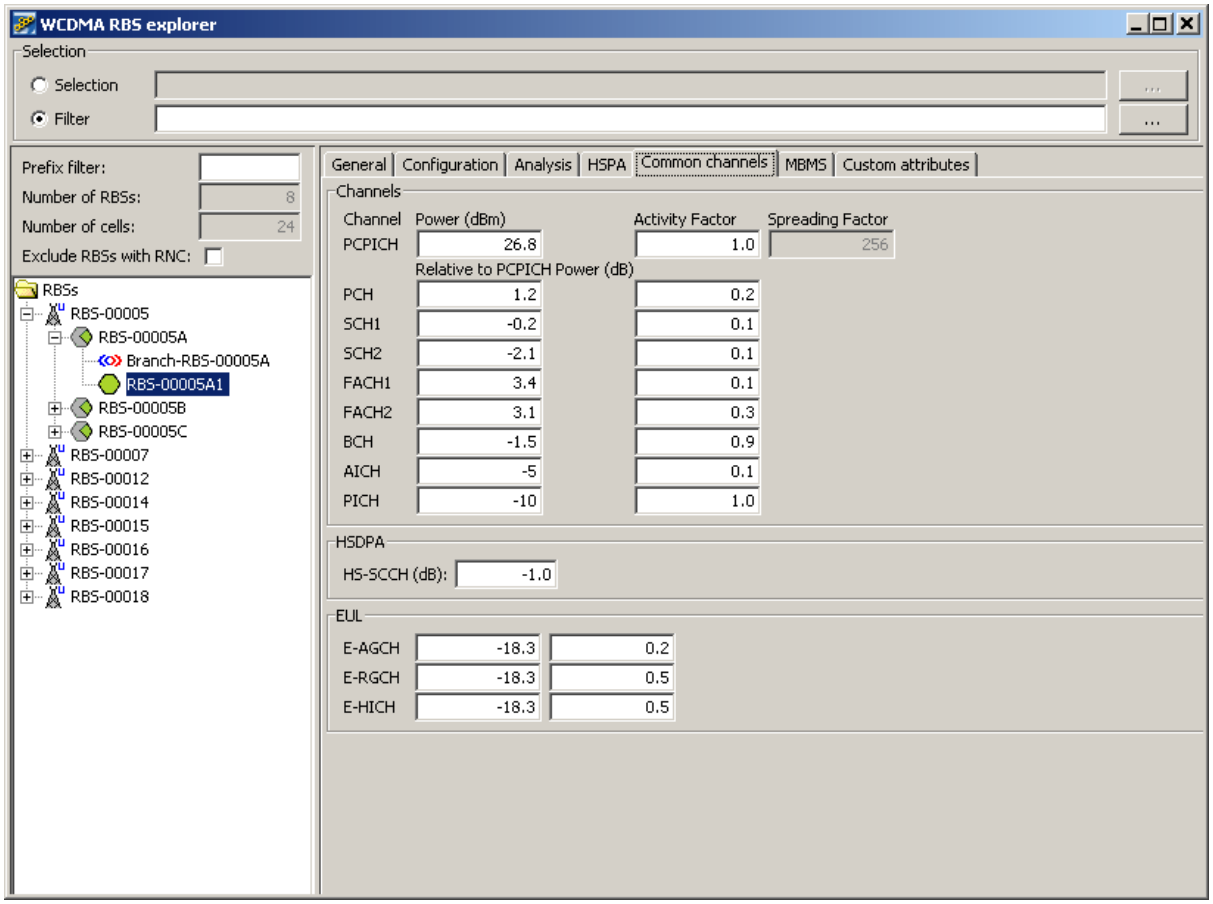
P_{CPICH} = Max Tx power DL - 10 dB = 43 dBm - 10 dB **= 33 dBm**.

The output power values for the remaining common channels are set relative to the CPICH. Use the following table for the common channel parameter settings. Several values are fixed as described in the 3GPP standards.

Channel	Power (dBm)	Power relative to CPICH	Activity factor	Spreading factor
PCPICH	33	-	1.0	256
PCH	-	-0.4	0.2	128
SCH1	-	-1.8	0.1	-
SCH2	-	-3.5	0.1	-
FACH1	-	1.8	0.1	128
FACH2	-	1.5	0.3	128
BCH	-	-3.1	0.9	256
AICH	-	-6.0	0.1	256
PICH	-	-7.0	1.0	256

Window to Use

Use the **UTRAN cell - Common channels** window to enter UTRAN cell common channel parameters:.



Fields on the Window

The following table describes the fields on the window:

Field	Description
PCPICH	The primary common pilot channel (PCPICH) carries the primary scrambling code of the cell. This value is updated when you run the Optimize pilot power function. The power setting for the CPICH is an important parameter for the coverage calculations in WCDMA analysis. Generally, the maximum power setting of the CPICH should not exceed 10% of the total cell output power. P_{CPICH} = Max Tx power DL - 10 dB = 43 dBm - 10 dB = 33 dBm. The output power values for the remaining common channels are set relative to the CPICH. • Power range: 6.0 - 43.0 dBm. Initial value = 33.0. • Activity factor initial value = 1.00. • Spreading factor fixed initial value = 256.
PCH	The Paging Channel (PCH) is a downlink transport channel that carries data relevant to the paging procedure. • Power range: -35.0 - 15.0. Initial value =1. 2. • Activity factor range: 0 - 1. Initial value = 0.2. • Spreading factor range 4 - 512, initial value = 128.
SCH1	Primary synchronization channel (PSCH) carries the primary synchronization signal. • Power range: -35.0 to 15.0. Initial value = 0.2. • Activity factor range: 0 - 1. Initial value = 0.1 Spreading factor is not applicable.
SCH2	The secondary synchronization channel (SSCH) carries the secondary synchronization signal. • Power range: -35.0 to 15.0. Initial value = -2.1. • Activity factor range: 0 - 1. Initial value = 0.1 Spreading factor is not applicable.
FACH1	Forward access channel, a downlink transport channel that carries control information to terminals in a given cell. • Power range: -35 to 15. Initial value = 3.4 • Activity Factor - Percentage of time a channel is transmitted. Range: 0 - 1, Initial value = 0.1 • Spreading factor range 4 - 512, initial value = 128.

Field	Description
FACH2	Forward access channel, a downlink transport channel that carries control information to terminals in a given cell. • Power range: -35 to 15. Initial value = 3.1 • Activity factor - Percentage of time a channel is transmitted. Range: 0 - 1, Initial value = 0.1 • Spreading factor range 4 - 512, initial value = 128.
BCH	The broadcast channel (BCH) is a transport channel used to transmit information specific to UTRAN or a given cell. • Power range: -35.0 - 15.0, initial value =-1.5. • Activity factor range: 0 - 1, initial value = 0.9. • Spreading factor fixed initial value = 256.
AICH	The acquisition indicator channel (AICH) is mandatory to carry information relevant to physical layer procedures. • Power range: -22.0 - 5.0, initial value = -5. • Activity factor range: 0 - 1, initial value = 0.1. • Spreading factor fixed initial value = 256.
PICH	The paging indication channel (PICH) is mandatory to carry information relevant to physical layer procedures. • Power range: -22.0 - 5.0. Initial value = -10. • Activity factor range: 0 - 1, initial value = 1.0. • Spreading factor fixed initial value = 256.
HS-SCCH	High speed SCCH power relative to the CPICH power level in dB. Transmitted only when HSDPA is enabled for the cell. Min = -10 dB, Max = 10 dB, Initial value is -1 dB. HSDPA requires HS-SCCH to control HSDPA terminals over the entire cell. The HS-SSCH is allocated a power value with reference to the P-CPICH. One fixed power value is provided for the HSDPA HS-SSCH.
E-AGCH	The E-AGCH power value that is offset to PCPICH power, and the percentage of time that the channel is transmitted.
E-RGCH	The E-RGCH power value that is offset to PCPICH power, and the percentage of time that the channel is transmitted.
E-HICH	The E-HICH power value that is offset to PCPICH power and the percentage of time that the channel is transmitted.

Procedure

Follow these steps to define UTRAN cell common channel parameters:

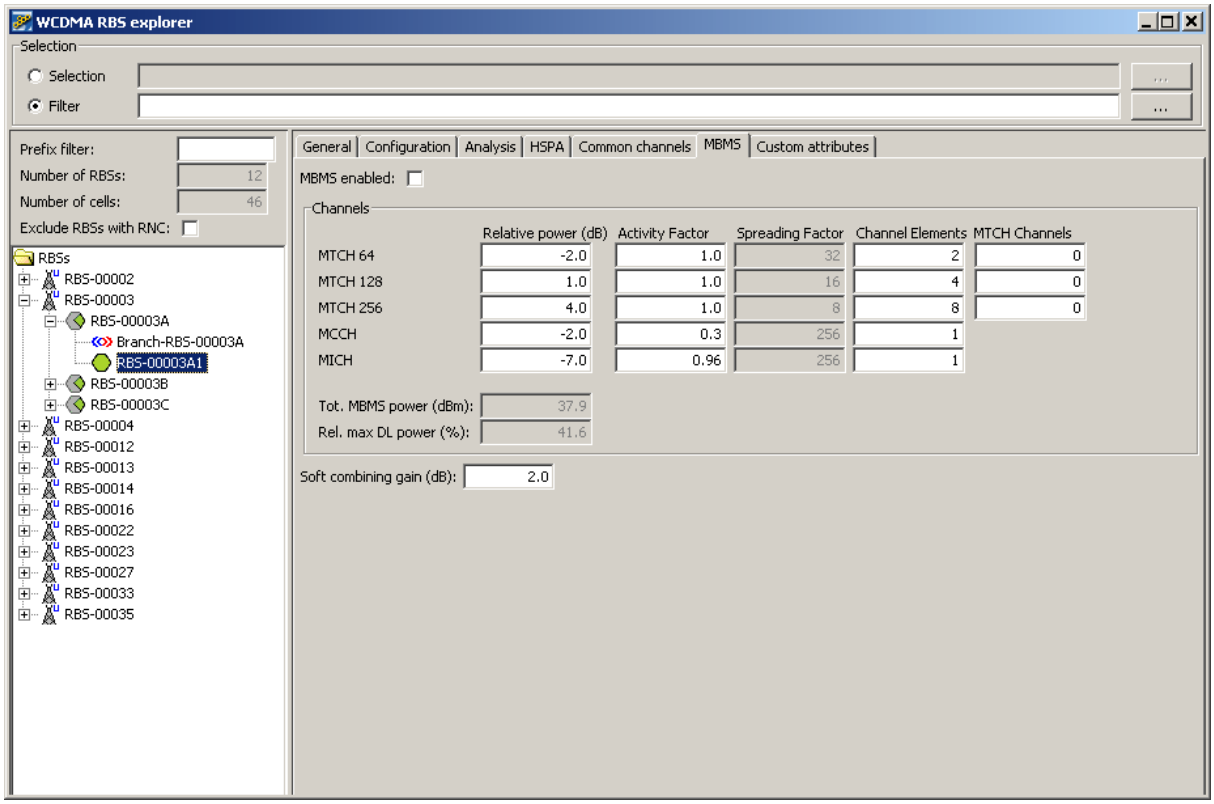
1. Select Utilities↗WCDMA RBS explorer.
2. Right-click a sector and select Add Cell from the menu. The Select an Available carrier window appears, listing available carriers.
3. Select a carrier, and click OK. The UTRAN Cell - General window appears.
4. Select the Common Channels tab, and add or change information in the fields as required.
5. Click Apply to preserve the information.

Define UTRAN Cell MBMS Parameters

Use this procedure to define Multimedia Broadcast Multicast Service (MBMS) parameters for the UTRAN cell.

Window to Use

Use the **UTRAN cell - MBMS** window to define UTRAN cell MBMS parameters:



Fields on the Window

The following table describes the fields on the window:

Field	Description
MBMS enabled	Enables multimedia broadcast multicast service (MBMS) in the cell.
Channels	MBMS channels available, including: • MTCH 64 - MBMS Traffic Channel • MTCH 128 - MBMS Traffic Channel • MTCH 256 - MBMS Traffic Channel • MCCH - MBMS Control Channel • MICH - MBMS Notification Indicator Channel The relative power in dB, activity factor, spreading factor, channel elements and MTCH channels are shown for each traffic channel.
MTCH 64	The MBMS Traffic Channel (MTCH) is the logical channel that carries the MBMS user data with rate 64.8 kbps. The output power is set relative to the CPICH. • Power range -35.0 - 15.0 dB, initial value = -4.0 • Activity factor range 0.0 - 1.0, initial value = 1.0 • Spreading factor fixed initial value = 32 • Channel elements range 1 - 10, initial value = 2 • Number of MTCH channels range 0-10, initial value = 0
MTCH 128	The MBMS Traffic Channel (MTCH) is the logical channel that carries the MBMS user data with rate 129.6 kbps. The output power is set relative to the CPICH. • Power range -35.0 - 15.0 dB, initial value = -1.0 • Activity factor range 0.0 - 1.0, initial value = 1.0 • Spreading factor fixed initial value = 16 • Channel elements range 1 - 10, initial value = 4 • Number of MTCH channels range 0 - 10, initial value = 0
MTCH 256	The MBMS Traffic Channel (MTCH) is the logical channel that carries the MBMS user data with rate 259.2kbps. The output power is set relative to the CPICH. • Power range -35.0 - 15.0 dB, initial value = 2.0 • Activity factor range 0.0 - 1.0, initial value = 1.0 • Spreading factor fixed initial value = 8 • Channel elements range 1 - 10, initial value = 8 • Number of MTCH channels range 0 - 7, initial value = 0

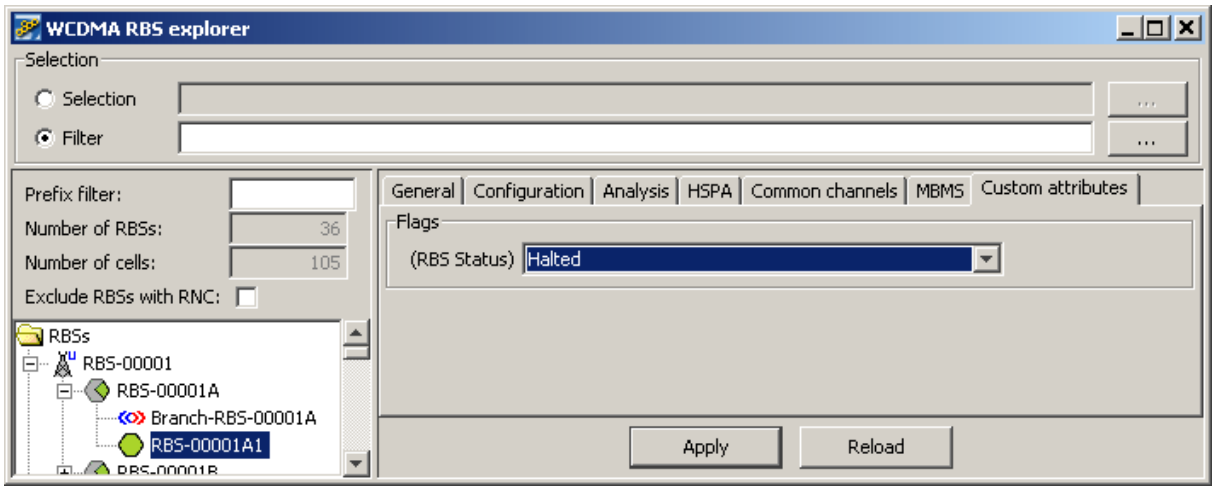
Field	Description
MCCH	The MBMS Control Channel (MCCH) broadcasts control information from the RNC to all MBMS UEs in one cell. The output power is set relative to the CPICH. • Power range -35.0 - 15.0 dB, initial value = -2.0 • Activity factor range 0.0 - 1.0, initial value = 0.3 • Spreading factor fixed initial value = 256 • Channel elements range 1 - 10, initial value = 1
MICH	The MBMS Notification Indicator Channel (MICH) is used to notify UEs about upcoming change in information on MCCH. The output power is set relative to the CPICH. • Power range -10.0 - 5.0 dB, initial value = -7.0 • Activity factor range 0.0 - 1.0, initial value = 0.96 • Spreading factor fixed initial value = 256 • Channel elements range 1 - 10, initial value = 1
Tot. MBMS power (dBm)	Total power of common control and MBMS channels.
Rel. max DL power (%)	MBMS to maximum cell power ratio. Field displays a red background if the combined power is set above the admission limit.
Soft combining gain (dB)	Gain when combining MTCH information from up to three radio links, that is, three cells. • Range 0 - 10 dB, initial value = 2.0

Define UTRAN Cell Custom Attributes

Use this procedure to apply custom attributes and flags to the UTRAN cell.

Window to Use

Use the **UTRAN cell - Custom attributes** window to set custom attributes for the cell:



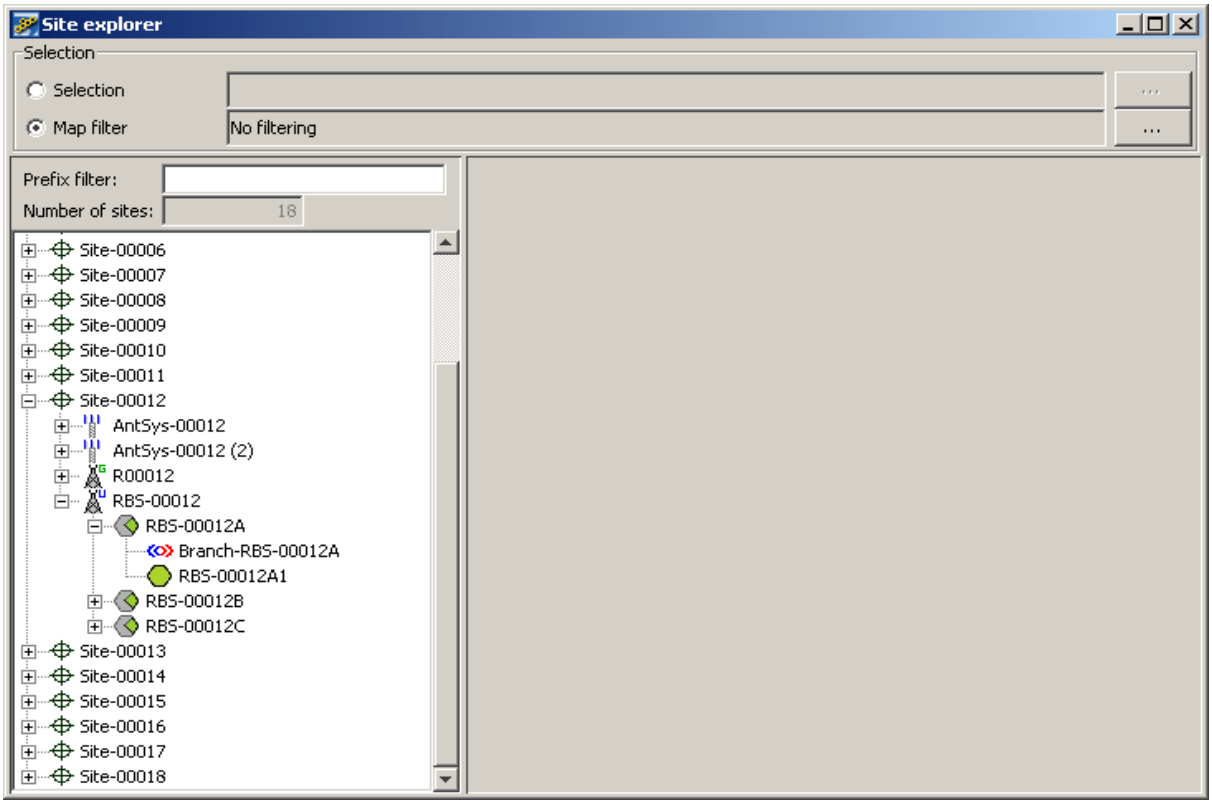
Fields on the Window

The following table describes the fields on the window:

Field	Description
Flags	Flags available to assign to the cell.

About the Site Explorer

The **Site explorer** displays all the sites in a network plan. Sites for all technologies are displayed. Use the **Site explorer** to add cells and antenna systems to a site.



Select **Utilities↗Site explorer** to start the explorer.

Fields on the Explorer Window

Using fields on the **Site explorer**, you can limit the number and kind of sites displayed in the window.

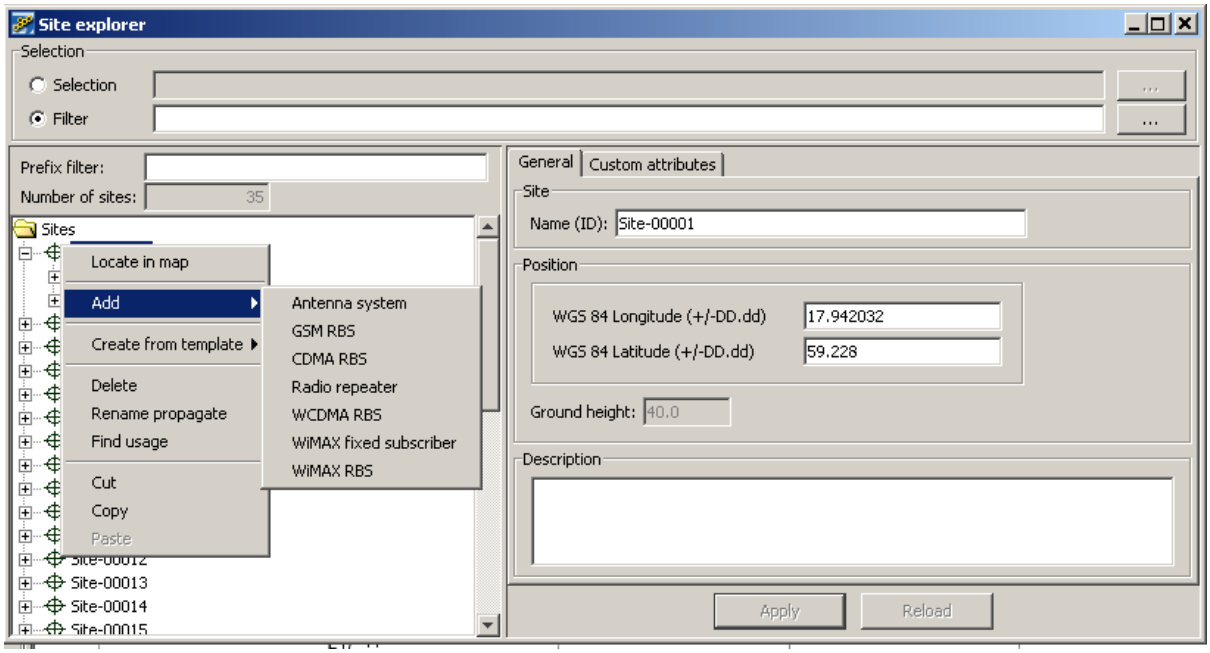
Field	Description
Prefix filter	Filters out any sites whose names contain the numbers and characters of the site IDs that you enter.
Number of sites	Total number of RBSs displayed in the view

Add Elements to Sites

Use the Site explorer to add network elements not available in templates.

Window to Use

Use the right mouse button menu of the Site explorer to add WCDMA site elements.



Menu Options

Options on the menu for WCDMA networks include:

Menu Option	Description
Locate in map	Highlight the site in the map display
Antenna system	Add antenna system to site
Radio repeater	Add radio repeaters to antenna systems
WCDMA RBS	Add RBS to site

Add Antenna Systems to Sites

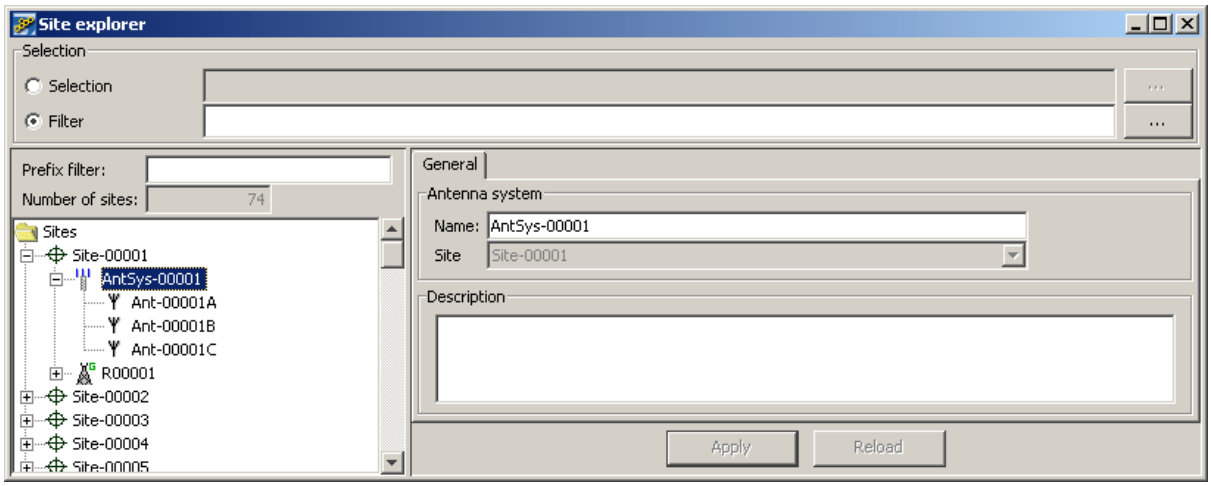
Use the Site explorer to add antenna systems to sites.

Specify the antenna location with its relative position to the site.

After you add antenna systems to sites, you can add antenna equipment to the antenna systems. Define the antenna equipment types first using the Equipment explorer.

Window to Use

Use the Antenna System - General window to add an antenna system to a site.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the antenna system. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Site	Site on which the antenna system is located.
Description	Description of the antenna system

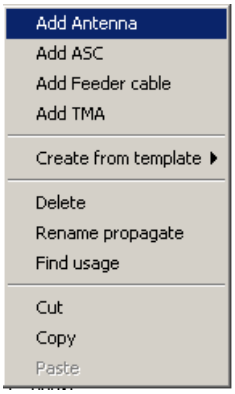
Procedure

Follow these steps to add antenna systems to sites:

1. Right-click a site and select **Add Antenna system** from the menu. The window displays the Antenna - General tab.
2. Enter the required information and click Apply to preserve the information.

Add Antenna System Equipment

After you add the antenna system to a site, you can add other antenna equipment to it. When you highlight and right-click an antenna system, the following menu is displayed:



You may add antennas, antenna system controllers, feeder cables, tower mounted amplifiers, and antenna towers to the antenna system.

Menu Options

Options on the menu include:

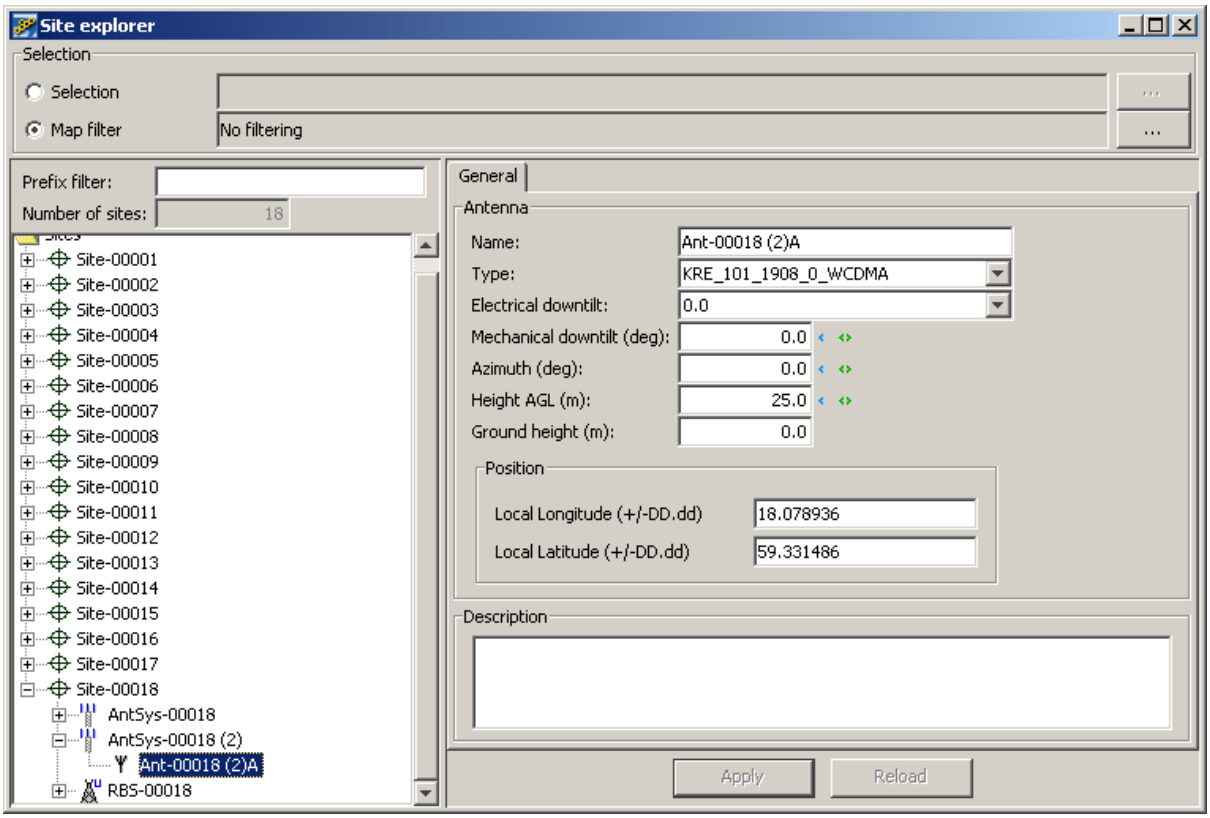
Menu Option	Description
Add Antenna	Add an antenna to the antenna system
Add ASC	Add an antenna system controller (ASC) to the antenna system
Add Feeder cable	Add feeder cable to the antenna system
Add TMA	Add tower mounted amplifier (TMA) to antenna system
Create from template	Add network elements from predefined templates
Delete	Delete the antenna system from site
Rename propagate	Copy the equipment and rename while copying
Find usage	Find all occurrences of the equipment in the project

Add Antennas to WCDMA Sites

Before adding antennas to sites, define antenna types in the **Equipment explorer**.

Window to Use

Use the **Antenna - General** window in the Site explorer to add an antenna to a WCDMA site.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the antenna for the antenna branch. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Type	Type of antenna. A second antenna branch in the same sector must use the same antenna type as the first. 0 = non-Ericsson product
Mechanical downtilt (deg)	Mechanical downtilt in degrees relative to the vertical plane. The tilt angle is fixed and set when the antenna is mounted. Range: 0 - 90. Initial value = 0.

Field	Description
Electrical downtilt	Electrical downtilt in degrees of the antenna lobe. Range: -90 to 90. Initial value = 0.0
Azimuth	Beam direction in degrees, calculated clockwise from north. Range: 0 - 360. Initial value = 0.
Height AGL (m)	Antenna height in meters above ground level (AGL). Range: 0 - 600. Initial value = 25 meters.
Ground height (m)	Antenna height in meters above the 0 (zero) level of the elevation map. If you set this to a value other than 0, you override the elevation map at this position. Range 0 - 600. Initial value = 0.0.
Position	Local longitude and latitude map coordinates of the site.
Description	Description of the antenna for the antenna branch

Procedure

Follow these steps to add antenna system equipment to sites:

1. Select Utilities↗Site explorer.
2. Right-click a site and select Add Antenna system from the menu. The antenna system is added to the site.
3. Right-click the antenna system and select Add Antenna from the menu. The Antenna - General window is displayed.
4. Add or change information in the fields as required, and click Apply to preserve the information.

Add ASCs to Sites

Use this procedure to add antenna system controllers (ASCs) to antenna systems at a site.

ASC Type Parameters

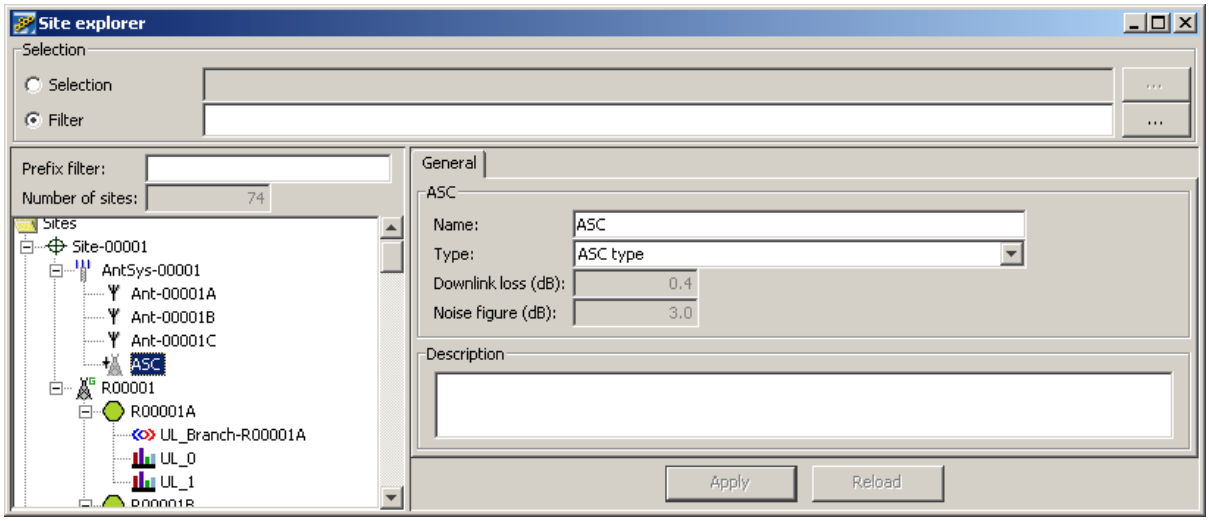
Use **Utilities↗Equipment explorer↗ASC types** to enter the initial values for antenna system controllers.

Parameter	Unit	Range	Initial value
Max. UL comp.	dB	0 to 15	6
DL loss	dB	0 to 15	0.2
Noise figure	dB	0 to 15	2.3

The noise figure of the cell is updated with the ASC noise figure, if you use an ASC in the antenna branch.

Window to Use

Use the **ASC - General** window to add ASCs to an antenna system at a site:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the ASC. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Type	Type of ASC
Downlink loss (dB)	Loss in dB on the downlink

Field	Description
Noise figure (dB)	Noise figure in dB for the ASC
Description	Description of the ASC

Procedure

Follow these steps to add ASCs to site:

1. Select Utilities↗Site explorer.
2. Right-click the antenna system of a site, and select Add ASC. The Select an ASC type window is displayed.
3. Select the ASC type you want to add. The ASC is added to the hierarchy tree, and the ASC - General window is displayed.
4. Enter the name for the ASC or select a new ASC type.
5. Click Apply to preserve the ASC information for the antenna system.

Add Feeder Cables to Sites

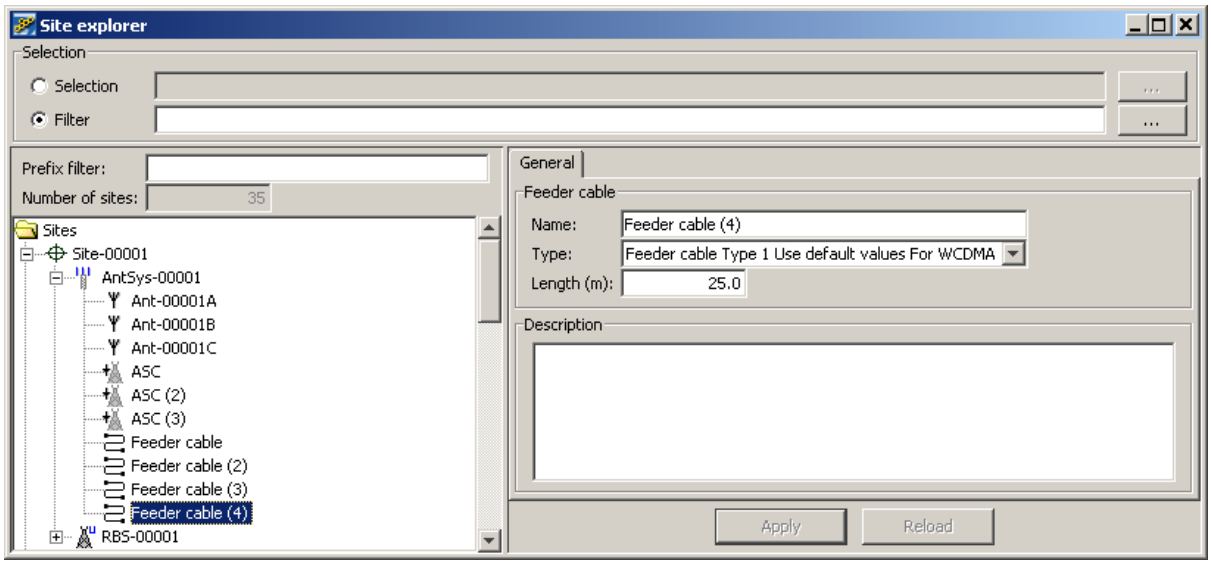
Use this procedure to add feeder cables to antenna systems at a site. You must add general information for the feeder cable, as well as feeder cable loss data.

Add Feeder Cable General Information

Use the **Site explorer** to add feeder cable information to a site antenna system.

Window to Use

Use the **Feeder cable - General** window to add feeder cables to an antenna system at a site:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the feeder cable. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Type	Type of feeder cable
Length (m)	Length in meters of the feeder cable
Description	Description of the feeder cable

Procedure

Follow these steps to add feeder cables to sites:

1. Select **Utilities↗Site explorer.**

2. Right-click the antenna system of a site, and select **Add Feeder cable** from the menu. The system displays the **Select a Feeder cable** window.
3. Select the feeder cable type you want to add. The feeder cable is added to the hierarchy tree, and the **Feeder cable - General** window is displayed.
4. Enter the name for the feeder cable or select a new feeder cable type.
5. Click **Apply** to preserve the feeder cable information for the antenna system.

Add TMAs to Sites

Use the **Site explorer** to add tower mounted amplifier (TMA) information to the antenna system of a site.

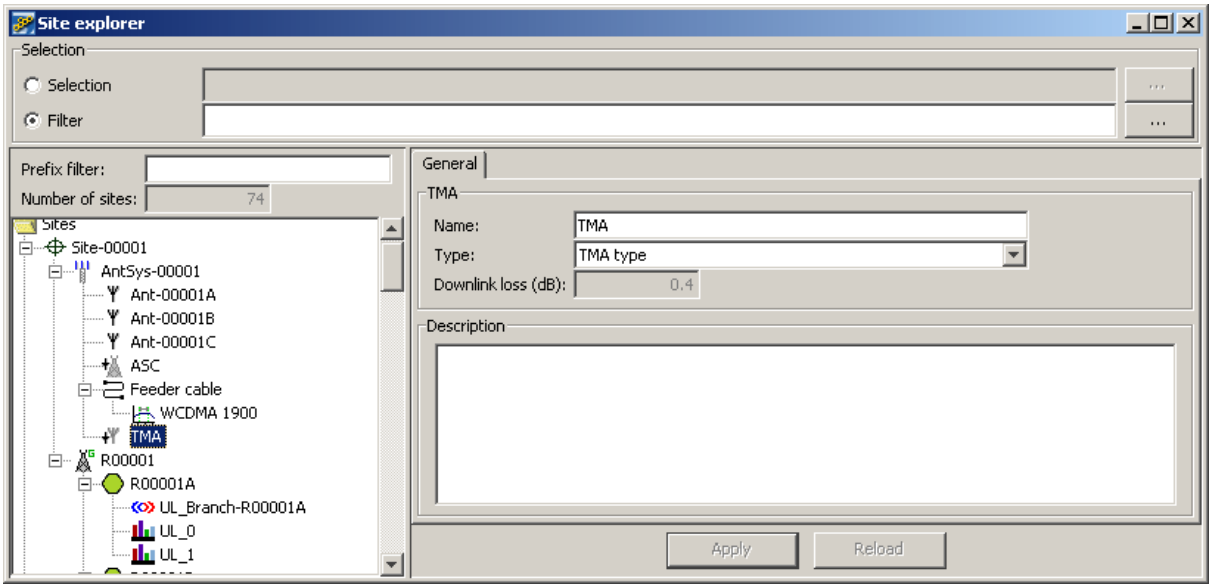
TMA Parameters

Use **Utilities↗Equipment explorer↗TMA types** to enter the initial values for tower mounted amplifiers.

Parameter	Unit	Range	Initial value
Max. UL comp.	dB	0 to 15	3 to 5 dB
DL loss	dB	0 to 15	0.2
Noise figure	dB	0 to 15	3 dB

Window to Use

Use the **TMA - General** window to add TMAs to an antenna system at a site:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the TMA. Field length: Field length: Maximum 128 characters and numbers. Do not use **/** ,\,',**%**
Type	Type of TMA

Field	Description
Downlink loss (dB)	Loss in dB on the downlink
Description	Description of the TMA

Procedure

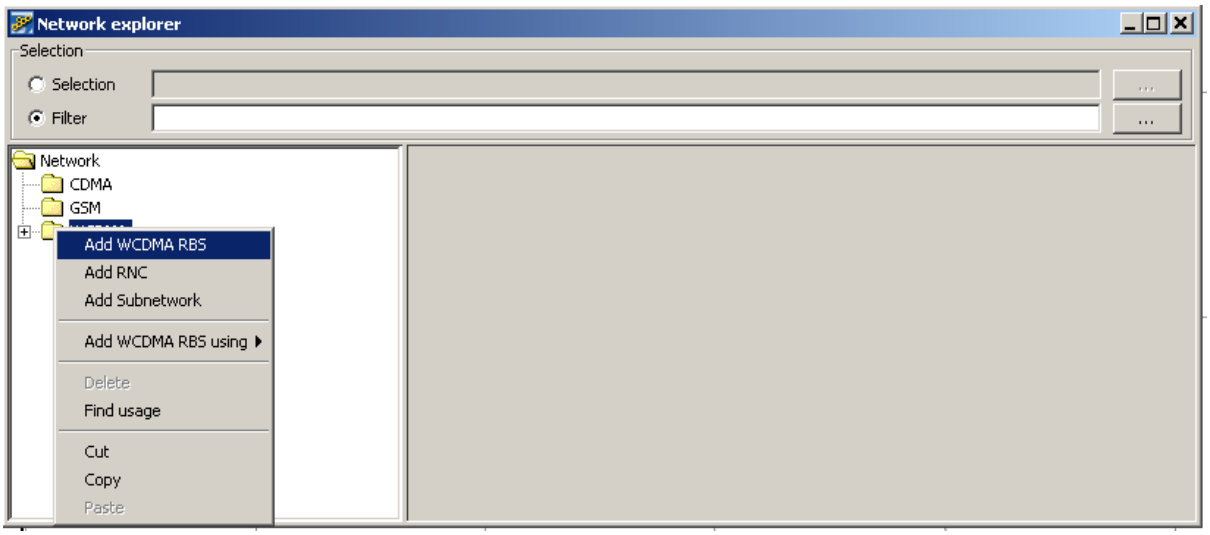
Follow these steps to add tower mounted amplifiers to antenna systems:

1. Select Utilities↗Site explorer.
2. Right-click the antenna system of a site, and select Add TMA from the menu. The system displays the Select a TMA type window.
3. Select the TMA type you want to add. The TMA is added to the hierarchy tree, and the TMA - General window is displayed.
4. Enter the name for the TMA or select a new TMA type.
5. Click Apply to preserve the TMA information for the antenna system.

About the Network Explorer

The **Network explorer** provides a network-level view of a plan. The elements you can add for each subnetwork include the RBS, RNC, sector, cell, antenna branch, and location area. The explorer shows the logical network hierarchy and the interconnection between RNC and WCDMA RBS.

Use the **Network explorer** to add, view, change, and delete WCDMA networks and subnetworks. Each object in the network hierarchy has a menu accessible with the right mouse button.



Select **Utilities↗Network explorer** to start the explorer.

Menu Options

Options on the menu include:

Menu Option	Description
Add WCDMA RBS	Add a WCDMA RBS to a network
Add RNC	Add an RNC to a network
Add Subnetwork	Add subnetwork to a network
Add WCDMA RBS using	Add a WCDMA RBS to a network using a template.

Define Subnetworks

Use the **Network explorer** to add subnetworks for mobile technologies.

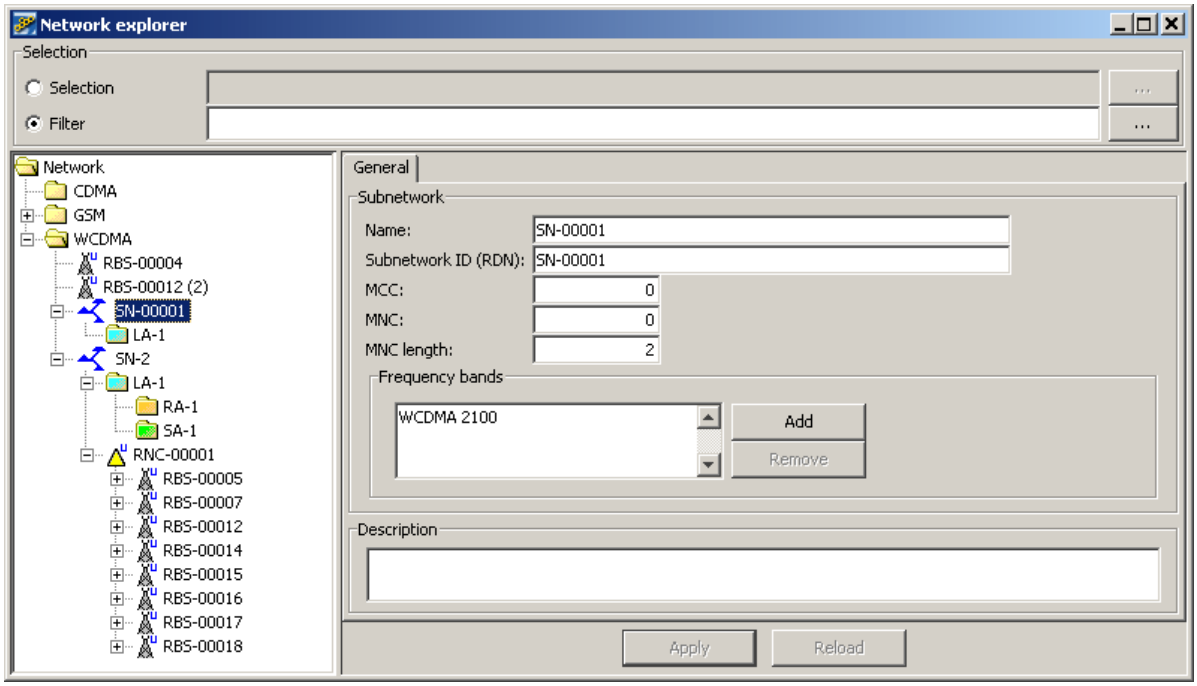
Define Frequency Bands First

To set up a subnetwork, you need to define frequency bands to be used by the subnetwork. Use the **Equipment explorer** to define frequency bands.

Define the lower and upper channel center frequencies for each WCDMA frequency band.

Window to Use

Use the **Subnetwork - General** window to add subnetworks to an existing network.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the subnetwork. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
Subnetwork ID (RDN)	Relative distinguished name (RDN) for the subnetwork. Field length: Maximum 128 characters and numbers. Do not use **/,\,',%**
MCC	Mobile Country Code for the subnetwork

Field	Description
MNC	Mobile Network Code for the WCDMA subnetwork. Range: 0 -999.
MNC Length	Mobile Network Code length for the subnetwork. Range: 2, 3. Initial value = 2.
Frequency Bands	Frequency bands used by the subnetwork.
Add	Adds a frequency band to the subnetwork.
Remove	Removes a frequency band from the subnetwork.
Description	Description of the subnetwork.

Procedure

Follow these steps to add subnetworks:

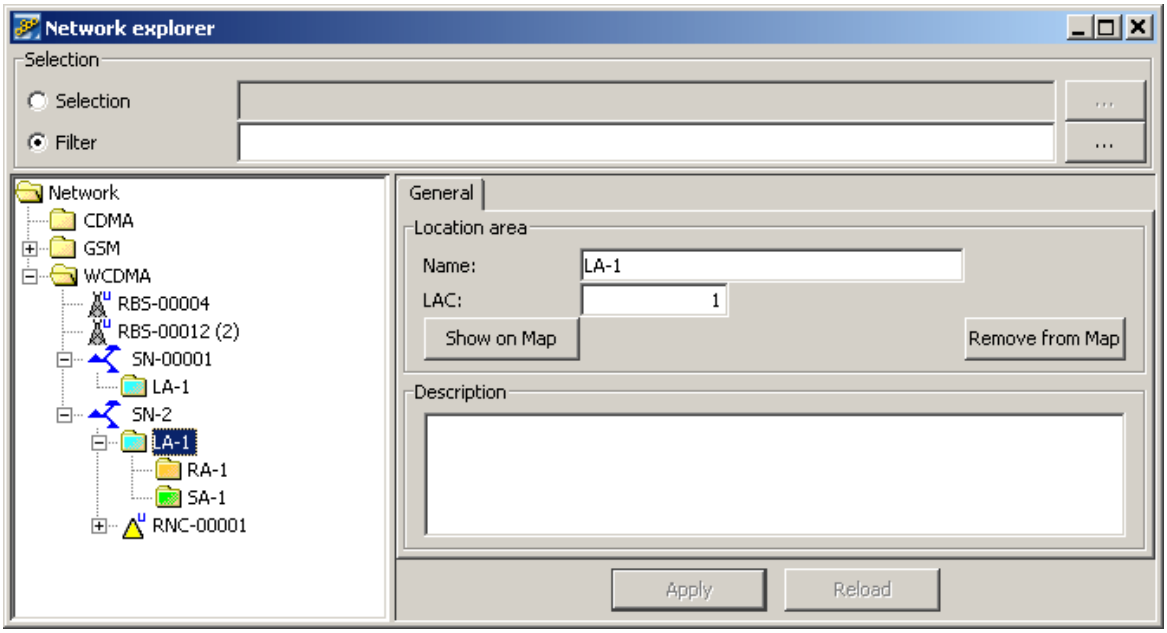
1. Select **Utilities↗Network explorer**. The window displays the Network folder with the WCDMA sub folder.
2. Right-click the WCDMA node, and select **Add Subnetwork from the menu**. The Select a Frequency Band window appears.
3. Select a previously defined frequency band for the subnetwork, or click Add to add a frequency band for the subnetwork.
4. Enter network information, and click **Apply**.

Add Location Areas to Subnetworks

Use this procedure to add location areas to subnetworks.

Window to Use

Use the Location area - General window to add a location area to a subnetwork.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the location area. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
LAC	Location Area Code number.
Show on Map	Displays the location area in the map display.
Remove from Map	Removes the location area from the map display.
Description	Description of the location area.

Procedure

Follow these steps to define a location area for a subnetwork:

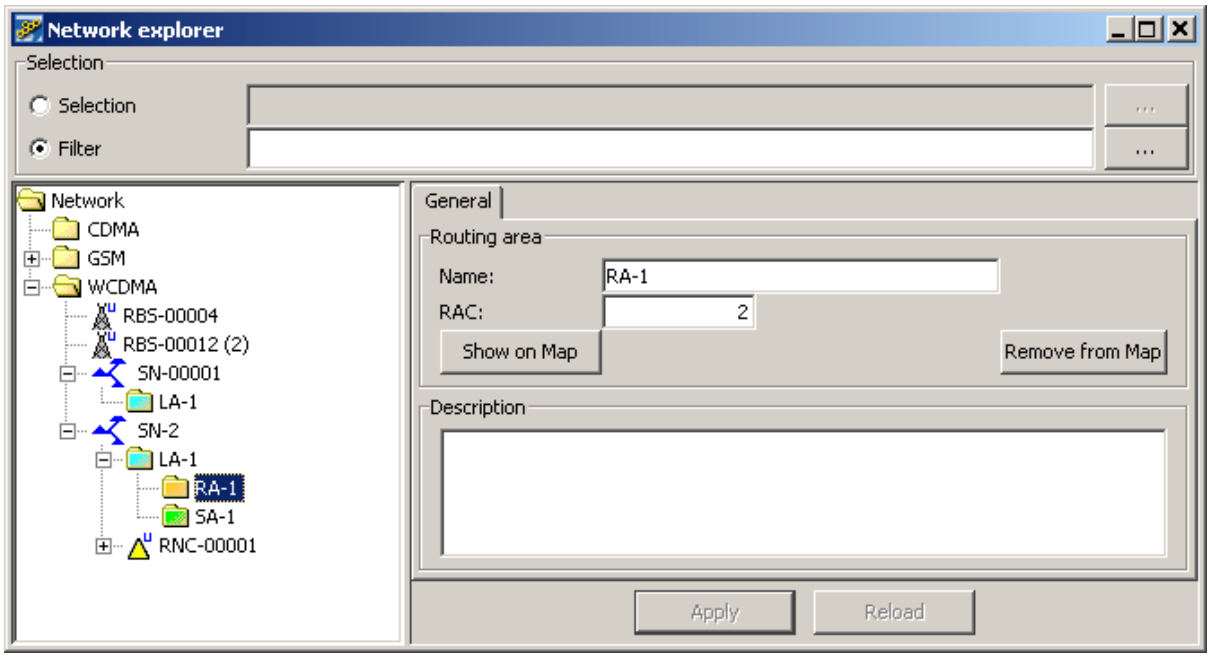
1. Select **Network explorer**, double-click to expand the WCDMA network and display the network elements.
2. Right-click a sub-network, and select **Add a Location Area** from the menu. The **Location area - General** window is displayed.
3. Enter the location area **Name** and **LAC** code.
4. To display the location area in the map display window, click **Show on Map**.

Add Routing Areas to Subnetworks

Use this procedure to add routing areas to subnetworks.

Window to Use

Use the Routing area - General window to add a routing area to a subnetwork.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the routing area. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
RAC	Routing Area Code number.
Show on Map	Displays the routing area in the map display.
Remove from Map	Removes the routing area from the map display.
Description	Description of the routing area.

Procedure

Follow these steps to define a routing area for a subnetwork:

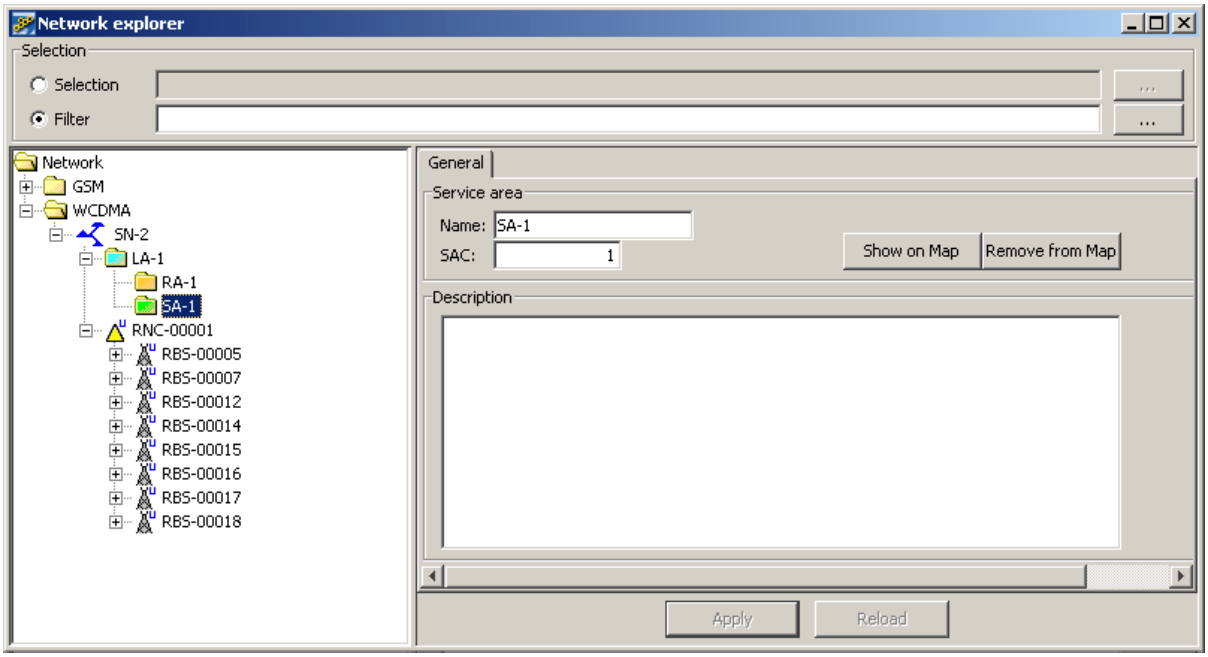
1. Select **Network explorer**, double-click to expand the WCDMA network and display the network elements.
2. Expand the tree to display the location area icon.
3. Right-click the **Location Area** icon and select **Add a Routing Area**.
4. Enter the routing area **Name** and **RAC** code.
5. To display the routing area in the map display window, click **Show on Map**.

Add Service Areas to Subnetworks

Use this procedure to add service areas to subnetworks.

Window to Use

Use the Service area - General window to add a service area to a subnetwork.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the service area. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
SAC	Service Area Code number.
Show on Map	Displays the service area in the map display.
Remove from Map	Removes the service area from the map display.
Description	Description of the service area.

Procedure

Follow these steps to define a service area for a subnetwork:

1. Select **Network explorer**, double-click to expand the WCDMA network and display the network elements.
2. Expand the tree to display the location area icon.
3. Right-click the **Location Area** folder and select **Add a Service Area**.
4. Enter the service area **Name**, **Service area ID**, and **SAC** code.
5. To display the service area in the map display window, click **Show on Map**.

Add RNCs to Networks

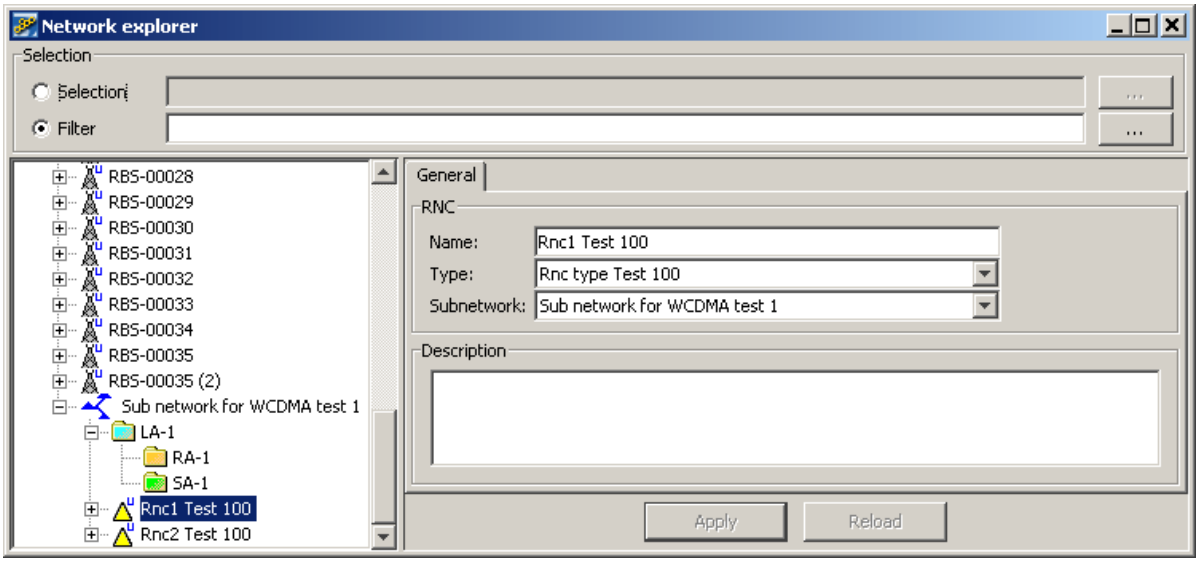
Use this procedure to add radio network controllers (RNCs) to networks. Use the **Network explorer** to add RNCs to networks.

Prerequisites

Before you add general RNC information, define RNC types using the **Equipment** explorer.

Window to Use

Use the **RNC - General** window to enter radio network controller (RNC) information for a site.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Name	Name of the RNC. Field length: Maximum 128 characters and numbers. Do not use /,\,',%
Type	Radio Network Controller (RNC) type
Subnetwork	Subnetwork location of the RNC
Description	Description of the RNC

Procedure

Follow these steps to add RNCs to sites:

1. Select **Utilities↗Network explorer**.
2. Right-click the **WCDMA** folder, and select **Add RNC from the menu.** The Select a Subnetwork window appears.
3. Select a subnetwork, and click OK. The RNC - General window appears.
4. Enter information as required, and click Apply to preserve the information.

Delete Equipment and Service Types

Use this procedure to delete equipment and service types. The example given is for a frequency band. To delete other types, select the type and follow the same method.

Objects Referenced by Other Objects

You may not delete an object referenced by other objects. If you try to delete such an object, the application displays a message that the object is referred to by other objects.

Procedure

Follow these steps to delete equipment or services:

1. Select Utilities↗Equipment explorer or Utilities↗System explorer.
2. For example, to delete a frequency band type, select Utilities↗System explorer, open the **Frequency Band** folder, right-click on the band to delete, and select **Delete** from the menu.

   Select multiple types by using Ctrl-Click **Delete** on any one of them to apply to all.
3. In the confirmation window, select an option:

   To delete only the specified object, click **Yes**.

   To delete all the selected objects, click **Delete all selected**.

   To stop deletion of the specified object, click **No**. When you select **No** for the specified object and additional objects were selected, the application prompts you to delete the next selected object so you can select multiple objects quickly and delete only those specified by the window.

   To cancel all deletions, click **Cancel**.
4. If a conflict occurs, an error message describes the conflict.

4
Calculating Pathloss and CPLM

This chapter describes pathloss prediction and analysis plots produced when you calculate pathloss and the composite pathloss matrix (CPLM).

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Using Optimized Prediction Radius 4-3
Repeaters in Pathloss Calculations 4-5
Calculate Pathloss 4-7
Preparing for Composite Pathloss Matrix Calculation 4-11
Calculate Composite Pathloss Matrix 4-12

Introduction to Pathloss

Pathloss, Predictions, and Fading Margins

When using standard macro cell radio wave propagation models, coverage probability is around 50%. Most operators require coverage probability well above 95%. To consider shadow fading and to increase the coverage probability to reach required target values, an additional margin called the log-normal fading margin is added to the predicted pathloss.

The accuracy of the predicted pathloss depends on verifying the propagation model and tuning it based on drive test measurements.

Propagation Model Tuning and Puncturing

The fading margin applied should be close to the standard deviation of the predicted pathloss. For a standard macro cell propagation model, the standard deviation is in the area of 6 to 14 dB.

For a propagation model tuned towards local radio wave propagation conditions, the standard deviation can become much lower, around 4 to 6 dB.

Because mobile terminals in a WCDMA network can perform a soft or softer handover when approaching the coverage edge of their serving cell, the fading margin can be further reduced by the handover gain.

It is generally recommended to perform detailed network planning and WCDMA analysis based only on tuned propagation models to minimize the error margin in the predicted pathloss.

TEMS CellPlanner provides the feature of puncturing the predicted pathloss with measured pathloss data, thereby increasing the accuracy of the pathloss data that forms a vital input to WCDMA analysis.

Fading Margins

Using both propagation model tuning and puncturing of pathloss data with drive test measurement data allows network planner to improve accuracy of pathloss data.

Fading margins are applied to increase the coverage confidence mainly for link budget calculations. With a tuned propagation model and detailed map data available to run accurate pathloss predictions, the need for fading margins in the same order as used for link budget calculations decreases.

Using Optimized Prediction Radius

You can run the pathloss calculation in TEMS CellPlanner with an optimized prediction radius. TEMS CellPlanner calculates the optimized prediction radius when the signal strength has become -120 dBm.

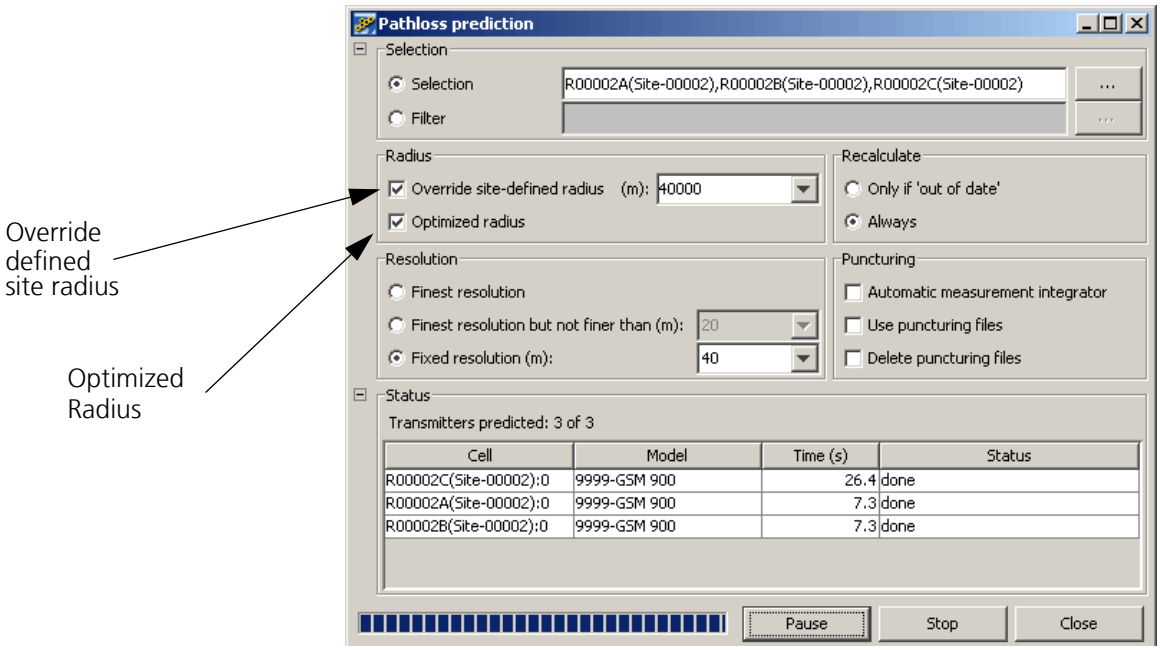
How Optimized Prediction Radius Works

Optimized prediction radius is determined in the following way:

- Calculate a maximum theoretical prediction radius based on an antenna's effective radiated power and free space propagation.
- Analyze if line of sight exists between the border area of the theoretical free space distance and decreases the prediction radius from free space distance if required.
- Calculate average land use attenuation in the border area of the line of sight/ no line of sight (LOS/NLOS) prediction radius. The prediction radius is decreased from the LOS/NLOS distance if required.
- Use the maximum distance for a useful signal when calculating pathloss for the selected propagation model.

Settings for Optimized Prediction Radius

The following example of the Pathloss prediction window shows the fields used to enable the optimized prediction radius:

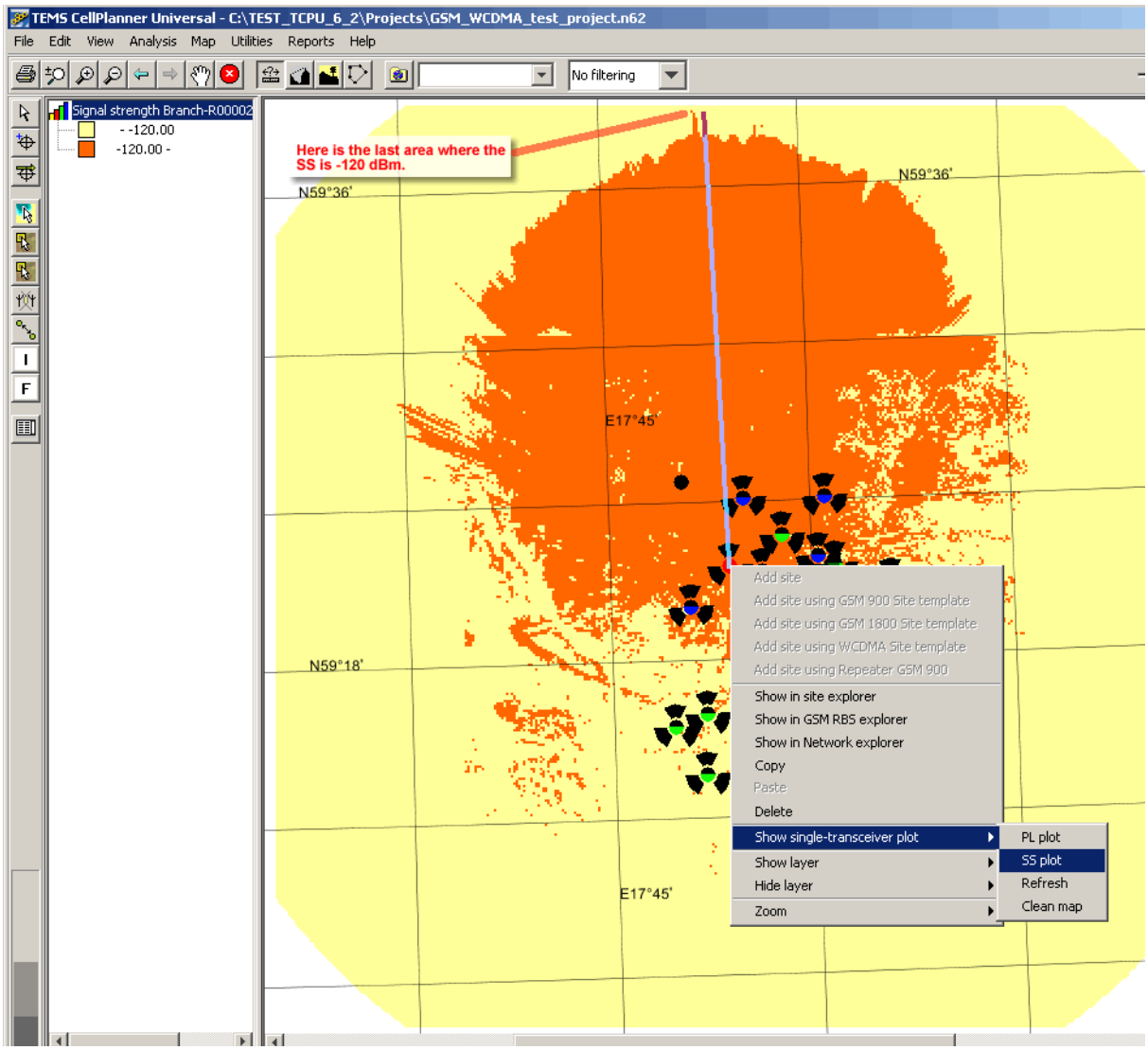


To calculate the optimized prediction radius

- Select Override site-defined radius and enter a long distance, for example, 40,000 m.
- Select Optimized radius, and run pathloss prediction.

Result of Using Optimized Prediction Radius

The result of the calculations can be viewed in the map display as shown in the following example:



Repeaters in Pathloss Calculations

The pathloss calculation saves the downlink pathloss from the antenna /repeater to the bin, and saves the antenna / repeater identity in CPLM. The application selects data for the antenna or repeater giving the highest received downlink power. The selected antenna is not always optimal for the uplink. You can model the time delays introduced by the repeater and by the detour of the radio signals.

First Round Pathloss Calculation

The first round is used only when the network contains radio repeaters. In the first round, the point-to-point pathloss from all cell antennas and cable repeater antennas to the pick-up antennas of the radio repeaters is predicted.

For a cell with more than one Tx antenna (including cable repeaters), the application selects, for every radio repeater, the cell's Tx antenna that gives the highest received power at the repeater. The azimuth and mechanical tilt for the repeater's pick-up antenna are calculated so that it becomes directed toward the selected Tx antenna.

When calculating the received power at the radio repeater, the application considers the:

- Donor cell's output power and downlink feeder loss
- Pathloss
- Pick-up antenna gain
- Pick-up antenna radiation pattern

The pathloss calculation considers the pick-up antenna height, which is usually not equal to the height (1.5 m) for which the ordinary pathloss predictions are made.

The effective donor coupling loss is calculated for every radio repeater. The repeater's gain and maximum downlink transmission power are applied to achieve the transmitted power.

Broadband Repeaters

For every broadband radio repeater without frequency conversion, the received power from all unwanted cells (within their prediction range) is also computed. The repeater's gain, losses and max Tx power DL are then applied to achieve the transmitted power for the unwanted cells.

Second Round Pathloss Calculation

In the second round, the area coverage from all cell antennas and repeater service antennas is predicted. The application selects, for every bin, the antenna or repeater giving the maximum received signal strength. The maximum received signal strength is transformed into pathloss relative to the cell's first Rx/Tx or Tx antenna and stored in CPLM.

The calculation considers the specific transmitter power settings and downlink feeder losses of the donor cell and repeaters.

For broadband radio repeaters without frequency conversion, the predictions in the second round also include the retransmitted signals from the unwanted cells.

Calculate Pathloss

Use this procedure to calculate pathloss for individual cells in a project. The output of pathloss prediction is the input to composite pathloss (CPLM) analysis.

Received Power and Pathloss Calculation

The application finds the antenna or repeater that gives maximum received power in every bin, either the power received in the bin directly or from the antenna branch of the cell.

Multiband Cell Support

The Calculate composite pathloss process makes two coverage predictions per cell, one for each frequency band.

Pathloss Calculations for Multiband Cells

For multiband cells, the calculation uses separate propagation models for the underlaid and overlaid subcells. The application also uses separate antenna branches with different antennas (or possibly the same dual-band antenna) for the underlaid and overlaid subcells. The coverage predictions for the underlaid and overlaid subcells are stored separately in CPLM.

Output of Calculating Pathloss

The output of calculating pathloss is a prediction containing both the donor cell's coverage and the coverage of the repeater(s) and/or additional antenna(s).

Broadband radio repeaters without frequency conversion also amplify transmissions from other cells than the donor cell. This additional coverage of unwanted cells is also output.

For WCDMA, new Rx noise figures for the donor cells are predicted.

Plots Generated by Calculating Pathloss

Calculating pathloss generates plots that show the coverage according to:

- Reverse link budget
- Site/cell placements and configurations

Data Used in Pathloss Algorithm

The pathloss algorithm uses elevation data, the propagation model, the RF correction, antenna gain, land use, and other factors to build a composite pathloss matrix with attenuation to each bin.

Site Z Value

If you import or change the Z value for a site (ground level), you must use the same elevation model as the elevation database for predicting pathloss.

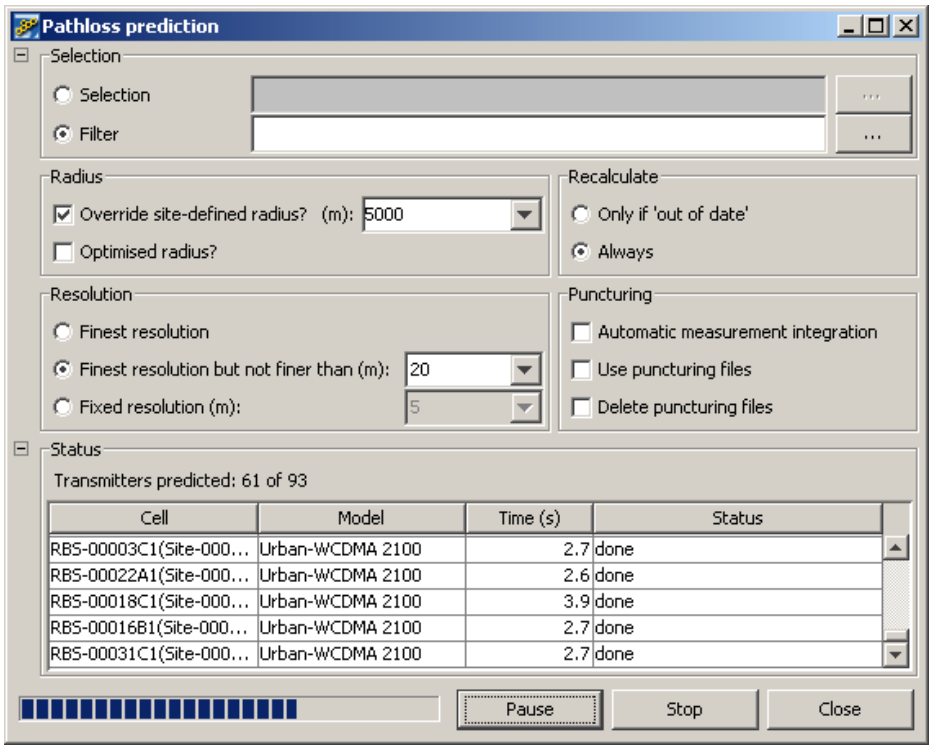
Prediction Radius Types

The prediction radius defines the maximum operating distance of a selected propagation model. TEMS CellPlanner offers these types of prediction radius:

- At antenna branch level. The radius value is set on individual antenna branch.
- An override during pathloss prediction that is used instead of the value from the antenna branch.
- Optimized by algorithms during calculations.

Window to Use

Use the Pathloss prediction window to predict pathloss.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Override site-defined radius	Indicates replacing the site defined radius for the calculation with a specified radius value. Select this option when using the optimized prediction radius • For initial pathloss prediction, use a larger radius than the actual cell radius to speed the calculation process. • For pathloss prediction performed before analysis and neighbor list optimization, use the actual radius of the cells to ensure greater accuracy.
Optimized radius	Indicates using an optimized prediction radius for pathloss calculations. See Using Optimized Prediction Radius, 4-3 for additional information.
Recalculate	Recalculate options for pathloss prediction: • Only if out of date - Saves calculation time if you made pathloss predictions for some of the cells earlier • Always - Makes new calculations for all selected cells

Field	Description
Resolution	Determines the resolution of the prediction. In initial pathloss prediction, you can enlarge the bin size to speed up analysis time. • Finest resolution - Uses the finest resolution available in the map data for the selected area of pathloss prediction. • Finest resolution but not finer than (m) - Limits the finest resolution to a specific value for the selected area of pathloss prediction. • Fixed resolution - Uses a fixed resolution specified in meters for the selected area of pathloss prediction. For WCDMA analysis, you need to make the bin size smaller to accommodate neighbor list optimization.
Puncturing	Puncturing options include: • Use available puncturing file in pathloss prediction • Delete puncturing files after pathloss predictions are made.
Status	Displays the antenna branches for which the pathloss is predicted. • Transmitter - The antenna branch for which the pathloss is predicted. • Model - The propagation model used for the pathloss prediction. • Time (s) - The time elapsed to calculate the pathloss for the antenna branch. Several calculations may run simultaneously. Therefore, the sum of the time values may be higher than the real time to calculate the pathloss for all branches. • Status

Procedure

Follow these steps to calculate pathloss:

1. Select Analysis‰Calculate pathloss.... The Pathloss prediction window appears.
2. In the Selection field, select a cell or a filter.
3. Set the Radius of the cells to use for the analysis.
4. Set the bin Resolution field to use for the analysis.
5. Set the Re-calculate area option.
6. To start calculating pathloss, click **Start**.

   To stop the prediction process before it has completed, click **Stop**.

   To close the window before or after running pathloss prediction, click **Cancel**.

Preparing for Composite Pathloss Matrix Calculation

Input to calculating pathloss includes:

- RF propagation parameters
- WCDMA service definitions
- WCDMA bearer definitions
- Traffic demand definitions
- Available site configurations

Generate a composite pathloss matrix to limit the amount of data contained in the pathloss data files for all cells. You can define the limits and thresholds for the pathloss matrix.

Pathloss Calculation Results

Pathloss prediction results include the following plots:

- Pathloss by Cell (in 3D)
- Pathloss Cell Count
- Pathloss Composite (Best Server)

CPLM Sorting and Radio Repeaters

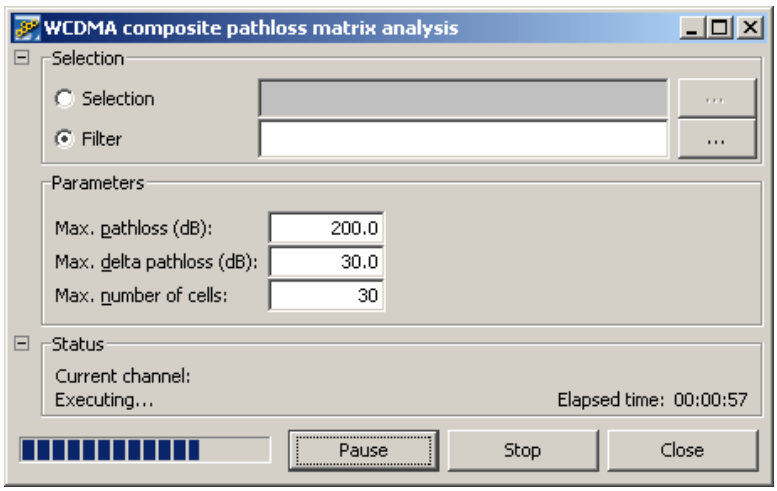
When radio repeaters are defined in the project, the ordering of pathloss by CPLM is not necessarily in increasing order for all bins, because of internal adjustments for the radio repeater influence.

Calculate Composite Pathloss Matrix

Use this procedure to calculate the composite pathloss matrix ((CPLM). Calculating the composite pathloss matrix combines the pathloss prediction from individual cells into a matrix to give an overview of pathloss for a project.

Window to Use

Use the WCDMA composite pathloss matrix analysis window to calculate the composite pathloss matrix.



Fields on the Window

The table below describes the fields on the window:

Field	Description
Max. pathloss (dB)	Maximum pathloss in dB allowed for the calculation; the highest pathloss relevant to the calculations. Any pathloss higher than this value is not included in the resulting pathloss calculation to limit the analyzed area.
Max. delta pathloss (dB)	Maximum delta pathloss in dB allowed for the calculation. The range of values between the lowest and highest pathloss in the resulting pathloss calculation. The lowest value minimum pathloss is searched. Any value higher than minimum pathloss + maximum delta loss is removed to limit the analyzed area.
Max number of cells	The maximum cells from which the pathloss values are calculated in one bin
Status	Status of the analysis process, showing carrier/channel being analyzed, elapsed time of the analysis, and indicates process completion.

Procedure

Follow these steps to calculate composite pathloss (CPLM):

1. Select **Analysis‰Calculate composite pathloss**. The **WCDMA composite pathloss matrix analysis** window opens.
2. Change any of the settings as required. If pathloss was run previously for any part of the current network, the fields display the parameters from the last run.
3. After setting all parameters, click **Start** to calculate composite pathloss. You can observe the progress in the **Status** area in the window.
4. When the **Status** area shows "CPLM Done," click **Close**.

5
WCDMA Live Traffic Distribution

This chapter describes how to run WCDMA live traffic distribution.

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Import WCDMA Live Traffic Data 5-3
Create Traffic Demand Mix 5-5
Generate WCDMA Live Traffic Distribution 5-7
View WCDMA Live Traffic Distribution 5-9

Introduction to WCDMA Live Traffic Distribution

WCDMA live traffic distribution allows you to create traffic density maps for a WCDMA mobile network traffic data per cell measured in a live network.

When tuning an existing network, it is convenient to be able to use live traffic measurements from the switch, as opposed to trying to estimate traffic theoretically.

The data from the switch specifies the live traffic per cell, and this can be used to model how the current network would respond to an increased traffic load in some cells.

Distributing Traffic in a Cell

When distributing traffic in a cell over its best server area, you can spread it uniformly or weighted according to landuse codes. WCDMA live traffic distribution generates a WCDMA live traffic density map that you can use as input to WCDMA analysis.

Process of Live Traffic Distribution

The process of live traffic distribution includes these stages:

1. Measure or predict the cell traffic for a specific service. Convert this measurement/prediction to an approximate users for each cell.
2. Use the Live traffic file import to import the data to TEMS CellPlanner. Optionally, you can manually enter the data for individual WCDMA cells.
3. Optionally, create a landuse-based map and select the weight for each landuse code.
4. Run WCDMA live traffic distribution to create the traffic density map.
5. Set up a traffic demand mix, and assign the traffic density maps to appropriate traffic demands.
6. Run WCDMA analysis with the live traffic demand mix.

Import WCDMA Live Traffic Data

Format of Live Traffic Import File

The live traffic import file can be stored as a text file and should include two columns: the WCDMA cell identity in the first column, and WCDMA traffic (corresponding to the number of users) in the second column. The cell identification can be done in two ways. If all WCDMA cells in the project have unique names, you can use the cell name as identifier. If names are not unique, use the RBS Name/Cell Name combination as identifier.

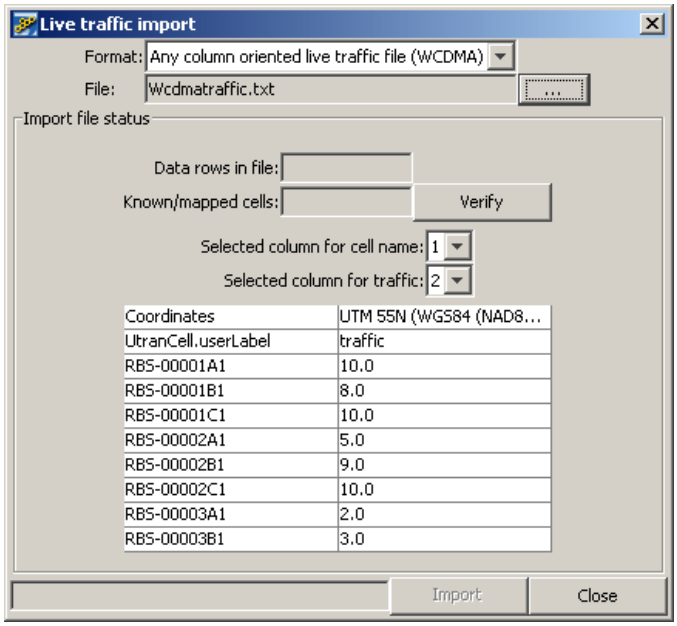
The following is an example of format for live traffic import file.

```
RBS-00001/RBS-00001A1    11.3
RBS-00001/RBS-00001B1     7.9
RBS-00001/RBS-00001C1    10.1
```

You can create a template for import using the generic export.

Window to Use

Use the Live traffic import window to import a live traffic data.



Prerequisites

You must set up the WCDMA sites in a project before performing the live traffic import.

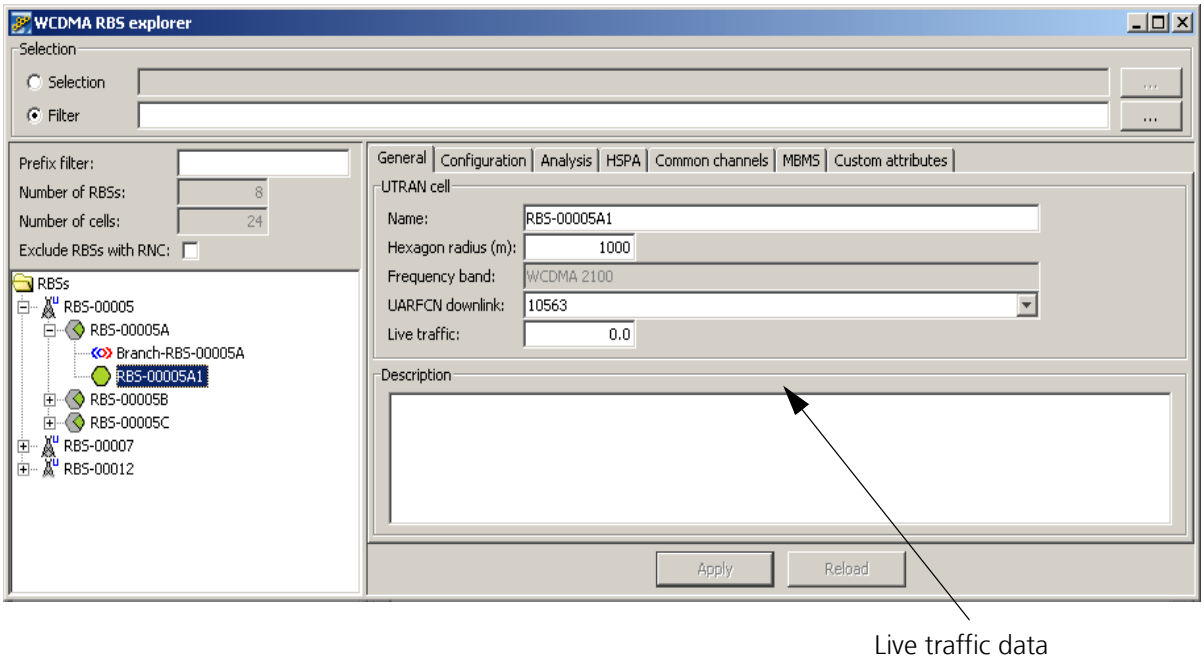
Procedure

Follow these steps to import live traffic data:

1. Select **File↗Import↗Live traffic text file...**. The **Live traffic import** window is displayed.
2. Select the file to import, and click **Import**. The window displays the status of the import.
3. When the import completes, click **Close** to close the window.

Results of Live Traffic Import

The imported live traffic data is stored in the UTRAN cell information for each cell and is displayed in the field **Live traffic**, as shown in the example below:.



Create Traffic Demand Mix

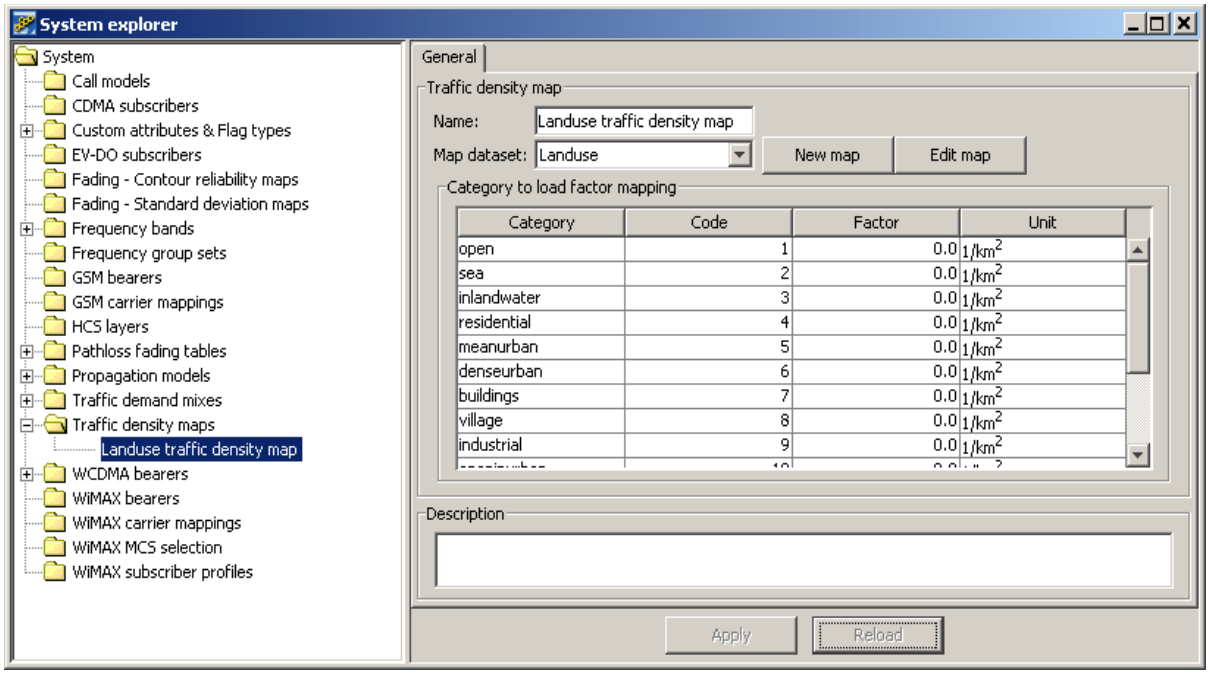
To use the live traffic data in calculations, you need to create a live traffic density map and a traffic demand mix.

Live Traffic Density Map

You can apply landuse based weighting for a traffic density map, where terminal densities are defined for each landuse code. With live traffic distribution, the traffic demand per cell is scaled according to the assigned landuse based weighting factor.

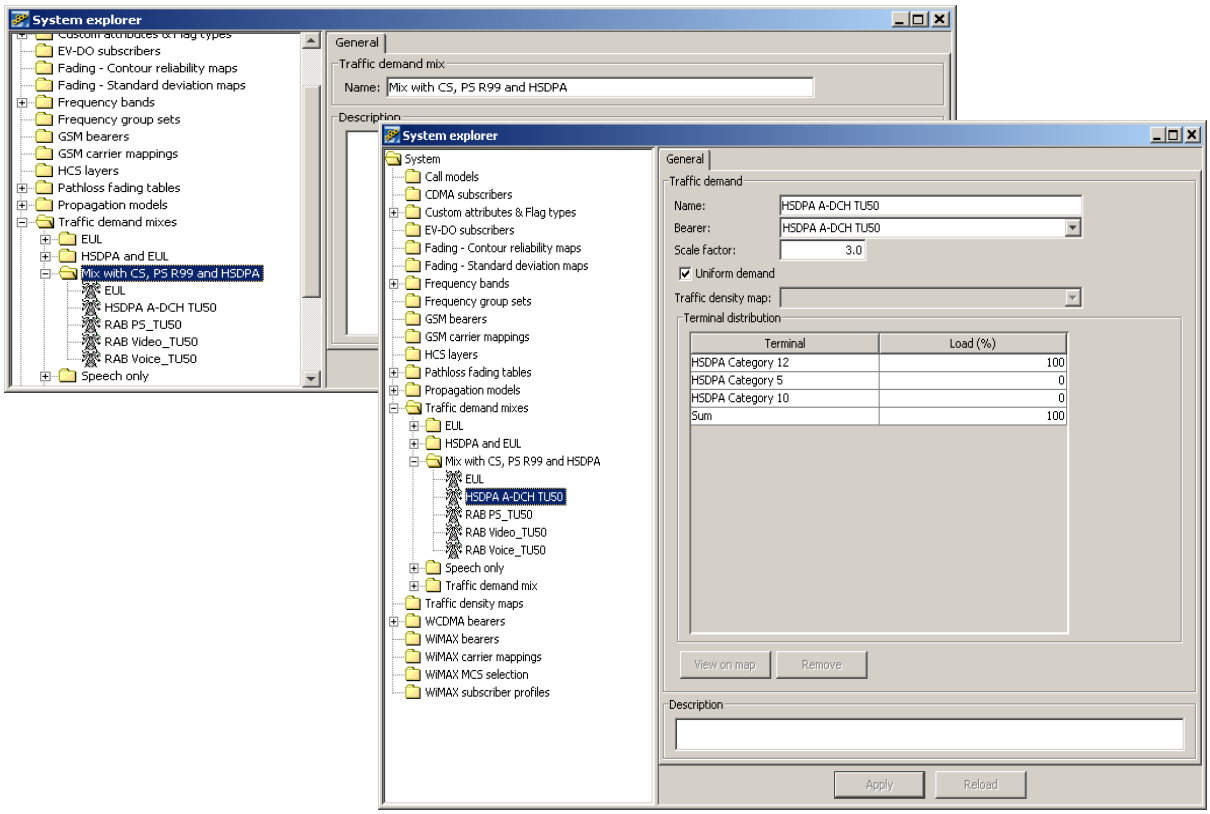
For example, cells within a landuse based weighting factor of 2 terminals per square kilometer results in two times more traffic than cells with a landuse based weighting factor of 1 terminal per square kilometer.

After you set up the traffic demand mix, create a live traffic density map as shown in the following example:



Traffic Demand Mix

Use procedures described in the *TEMS CellPlanner Common Features User's Guide* to create the traffic demand mix, as shown in the following example:



Generate WCDMA Live Traffic Distribution

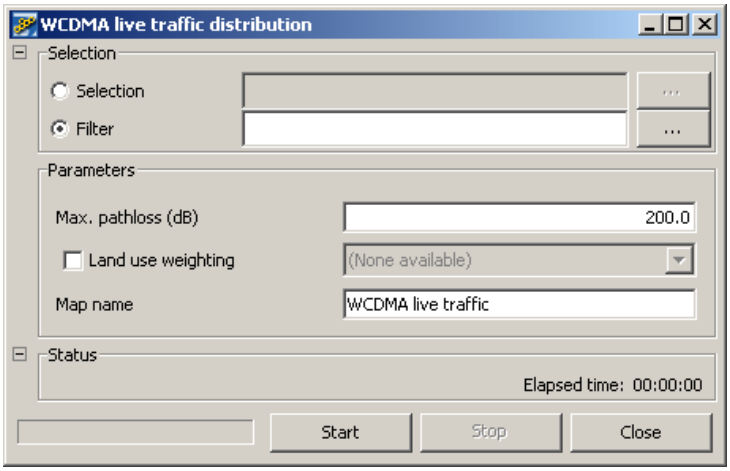
Prerequisites

For all WCDMA cells carry the imported live traffic, you must:

- Calculate pathloss
- Create the WCDMA composite pathloss matrix (CPLM)

Window to Use

Use the **WCDMA live traffic distribution** window to distribute live WCDMA traffic and create a WCDMA traffic density map:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Selection	Here you select the cells which traffic to be distributed.
Max pathloss	The pathloss between the sector and a bin. This value must be less than the limit you define. If no sector exists with a pathloss less than the limit, no best serving sector is assigned to a bin. initial and maximum values are derived from the composite pathloss matrix (CPLM).

Field	Description
Land use weighting	Weights the traffic using with the land use weights defined in the land use weight map and allows you to select the weight map from traffic density maps of land use type with at least one non-zero weight. If this option is not selected the traffic is spread uniformly in the cells best server area.
Map name	The name of the traffic density map to be created. The map file is stored in the map directory so the name entered must be unique. A traffic density map object is added with the same name as the map name.

Procedure

Follow these steps to run WCDMA live traffic distribution:

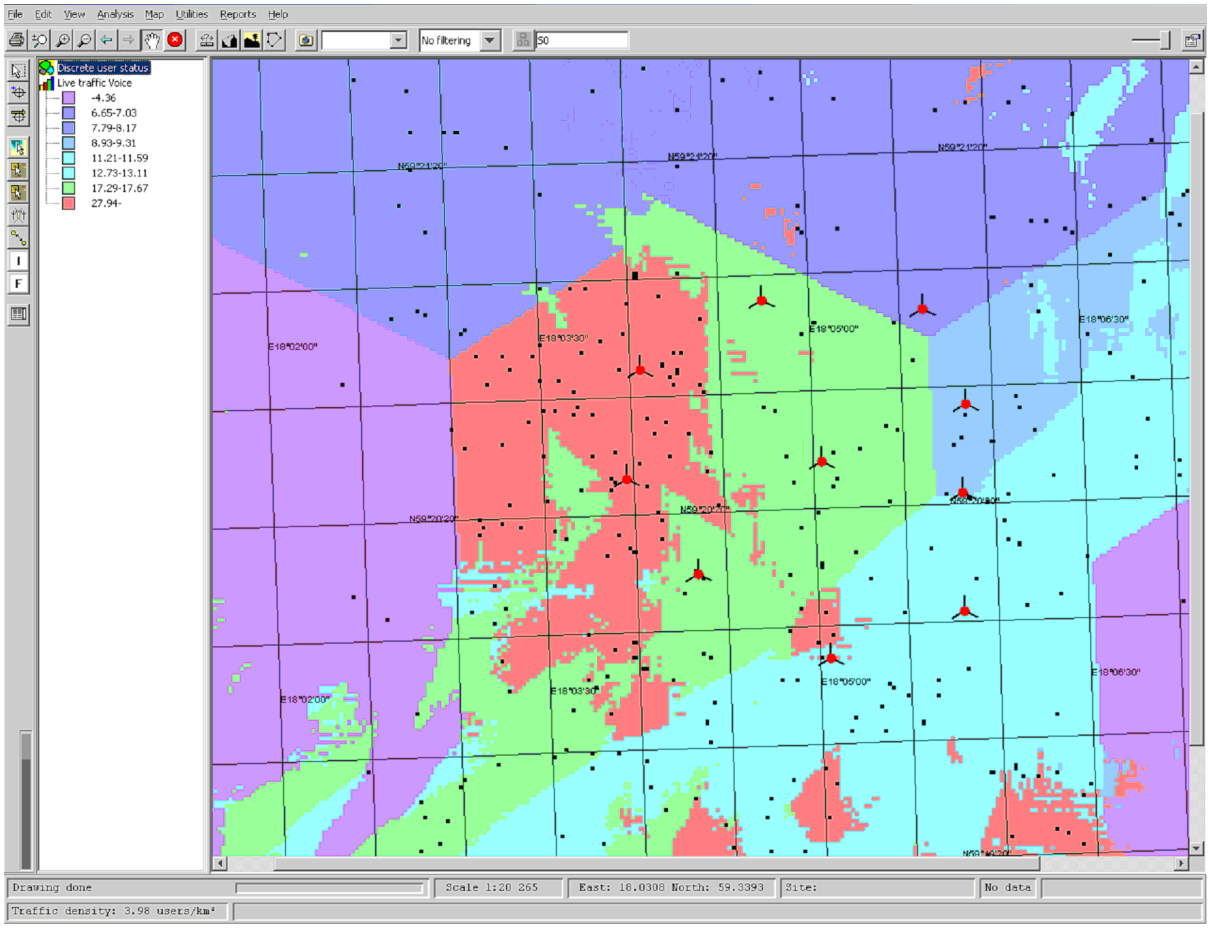
1. Select Analysis↗WCDMA↗Distribute live traffic. The WCDMA live traffic distribution window is displayed.
2. Enter the Landuse pathloss value, land use weighting (if desired), and the name of the map to create.
3. Click Start. The live traffic distribution map is created in the selected directory.

View WCDMA Live Traffic Distribution

The output of the function is a traffic density map. You can view the WCDMA traffic density map by adding it as a map layer.

Example of WCDMA Live Traffic Distribution

Iterative WCMDA analysis uses the live traffic demand information in the simulation. An example of user distribution from Monte Carlo analysis using the imported live traffic map is shown in the following plot:



6
WCDMA Analysis

This chapter describes how to run iterative WCDMA analysis with and without Monte Carlo simulations.

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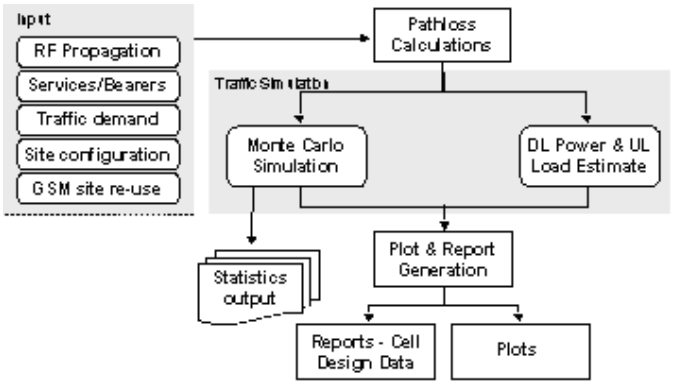
Overview of WCDMA Analysis

Modes of WCDMA Analysis

The following illustration shows the WCDMA analysis methods available in TEMS CellPlanner:



Starting with the input of RF propagation parameters, service, WCDMA bearer and traffic demand definitions as well as available site configurations, a pathloss prediction is made. To limit the amount of data contained in the pathloss data files for all cells, a composite pathloss matrix is generated. You can define the limits and thresholds within which the pathloss matrix is generated.

TEMS CellPlanner offers two modes for running WCDMA analysis:

- Iterative analysis based on Monte Carlo simulations
- Non-iterative analysis

The analysis mode to select for the network plan depends on the stage of the network design, and on the desired output and accuracy of the analysis.

With any of the WCDMA analysis modes you can produce plots and reports. Statistics output required for detailed and final WCDMA radio network planning is available only from the Iterative WCDMA analysis.

Iterative Analysis with Monte Carlo Simulator

The Monte Carlo simulator assigns randomly distributed users to WCDMA cells and analyze the network coverage, capacity, handover situation, and other vital system parameters. The Monte Carlo simulator in TEMS CellPlanner provides flexibility when running WCDMA analysis, including independent modes of convergence.

Other simulator features include:

- True multi-service planning supported by a flexible definition and assignment of WCDMA bearers and terminal combinations.

- Assignment of fallback rates for users on packet switched bearers that cannot be supported on the maximum bit rate. Allows network coverage expansion at the expense of maximum bit rate of the bearer by simulating channel rate switching of a real WCDMA network.
- Simulation of admission and congestion control, considering UL and DL load, channelization codes, WCDMA bearer priority handling, and ASE air interface load.

Non-Iterative Analysis

Non-iterative analysis allows the you to enter cell based UL and DL load values and to quickly estimate WCDMA coverage and capacity for different bearers. The algorithm provides detailed plots on estimated coverage for pilot and traffic channels as well as handover and interference plots. See About Non-Iterative Analysis, 6-34 for further details.

Fading Margins and Iterative Analysis

It is not recommended to apply fading margins to iterative WCDMA analysis based on Monte Carlo simulations.

Depending on the required coverage confidence, the resulting fading margin may become negative due to the applied handover gain that compensates for a large part of the long-term fading.

Higher fading margins must be applied when:

- The propagation model cannot be tuned towards the local wave propagation conditions
- There is no reliable drive test measurement data available for puncturing the predicted pathloss values

Selection/Filter Options

The selection option for cells available in most windows is disabled on the WCDMA analysis window, since analysis is always based on the cell selection made previously for pathloss prediction and the composite pathloss matrix.

About WCDMA Analysis with Monte Carlo Simulator

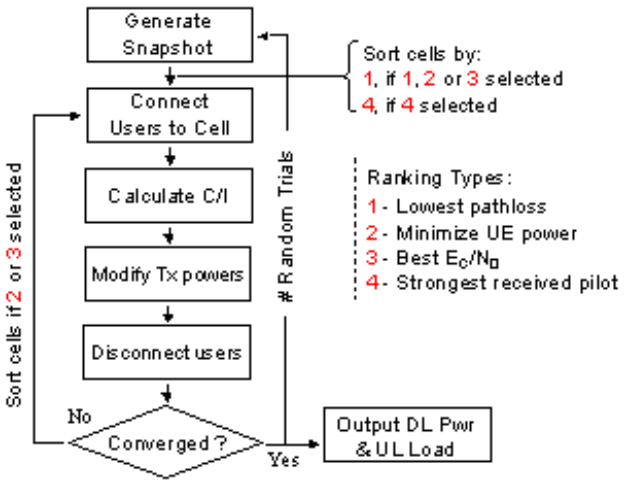
TEMS CellPlanner features a sophisticated Monte Carlo simulator that allows a high degree of flexibility in selecting calculation speed and result accuracy.

It is strongly recommended that you understand the modes of operation and convergence criteria you can use to run the simulation. The various settings for algorithm parameters have a major impact on the simulation result and you should select them very carefully. For detailed information on how parameters influence the outcome of the simulation, refer to the *WCDMA Technical Reference Manual*.

Operation of WCDMA Monte Carlo Simulator

Based on the interdependency between coverage and capacity in WCDMA there is a need to perform simulations on the position of users in the network and the corresponding power requirements to connect those users to the network.

An overview of the calculation flow in iterative WCDMA analysis is shown in the following illustration:



Generate Snapshot

At the beginning of each trial (generate snapshot), a certain amount of users are generated. The algorithm tries to connect all users to the available cells.

Connect Users to Cells

During the process of assigning users to cells, all cells that are potential candidates for connection must be ranked according to certain quality criteria. The available quality criteria for ranking cells as connection candidates are:

Criteria	Description
Lowest pathloss	The cell with the lowest pathloss is ranked first
Minimum mobile output power	The cell requiring the lowest mobile output power is ranked first. This ranking type takes UL interference for the cells into account.
Best Ec/Io	The cell with the best quality of the CPICH in terms of Ec/Io is ranked first. This is the initial setting since it is the CPICH the mobiles are measuring on for connection and handover control in UTRAN.
Strongest signal	The cell with the highest signal strength on the pilot channel is ranked first. This ranking algorithm does not take interference into account, but checks only for the highest received power on CPICH.

Calculate C/I

When users are connected to cells, the required power levels and generated interference levels can be calculated based on the WCDMA bearer for the user connection and the C/I requirements specified for the WCDMA bearers.

Modify Transmission Power/Disconnect Users

If overload occurs, depending on settings for admission and congestion parameters in the algorithm, some users may need to be disconnected from the system again. This leads to changed power and interference levels calculated in the next iteration.

Achieve Convergence

In each trial a certain number of iterations is required before the allocated power values and the received interference in the network have reached a stable value. Once the system has reached convergence the DL load and UL interference values per cell can be saved for later analysis.

If the maximum defined trials have not been reached, a new snapshot for user distribution is generated and the iterations start from the beginning.

After all trials have been performed, the statistical information is retrieved and the WCDMA plots are generated.

Monte Carlo Analysis Output

High-resolution graphical plots show WCDMA coverage from many perspectives, including:

- DL power required to support the WCDMA bearers
- Average DL cell power
- User defined percentile of DL cell power
- Average UL cell interference
- User defined percentile of UL cell interference
- Pilot quality in terms of Ec/Io
- Soft and softer handover areas
- Mobile EIRP

You can also select plots with detailed capacity related information. Monte Carlo analysis generates detailed statistics, useful for further analysis and improved network design.

Choosing Convergence Criteria for Monte Carlo Analysis

You can assign specific convergence criteria for Monte Carlo analysis, determined by the analysis speed and accuracy required. The following convergence criteria are available:

- UL noise rise (cell based)
- UL noise rise and DL power (cell based)
- UL and DL C/I (user based)

UL Noise Rise Convergence on Cell Level

The UL noise rise convergence criteria based on cell level is the simplest for Monte Carlo analysis. An analysis trial is completed as soon as the variation in UL noise rise of all cells between the iterations is lower than the defined convergence limit.

UL cell level mode is the quickest of the Monte Carlo analysis options and allows you to rapidly assess coverage and capacity of the WCDMA network.

UL Noise Rise and DL Power Convergence on Cell Level

In addition to the UL noise rise, the convergence criterion evaluates the DL power allocation of each cell in the network. WCDMA analysis becomes more accurate, since both the UL and the DL of all cells reach a specified convergence limit before a trial is considered to be completed.

UL and DL C/I Convergence On User Level

The UL and DL user level convergence criterion provides the most accurate mode of the Monte Carlo analysis with a flexible assignment of percent of users to be converged. A trial is deemed completed only if the specified percentage of all users connected to the system has reached the threshold value you define.

You get detailed information on the user connection status and on the amount of users that are converged and those that are connected but not converged.

User level convergence mode provides accurate simulation results for traffic channel coverage and system capacity. At the same time it requires the most computation power and time to complete. Normally you use user level mode in the final stage of designing a WCDMA network.

HSDPA/HSUPA and Monte Carlo Analysis

By using the options HSDPA simulation enabled, you can include simulation of HSDPA and EUL/HSUPA users into WCDMA analysis.

Provided that all other simulation parameters have been set correctly, you can simulate HSDPA/HSUPA users as part of WCDMA analysis. After successful simulation, WCDMA analysis generates statistics and plots specific for HSDPA/HSUPA.

Modeling AMR Speech

Use a WCMA bearer defined for Adaptive Multi Rate (AMR) speech to model AMR data rates in Monte Carlo simulation and plot generation.

Adjusting Simulation for Complex Networks

WCDMA analysis with Monte Carlo simulation is not a linear calculation process based upon a set of input parameters to produce a fully repeatable result. It is a *simulation engine* that tries to find a balanced state for a planned network (convergence) using random processes. The deterministic approach of network planning used with 2G networks does not apply to 3G.

A simulator needs some parameter limits, within which the algorithm continues to optimize power settings, data rates and user connection status. Once a convergence limit is reached, the algorithm stops to output the relevant results from a trial (snapshot).

Random Processes Included in Simulation

The simulator contains several random processes to provide flexibility for:

- Getting users connected as closely as possible within the convergence limit to the target values for radio bearer quality.
- Enabling channel rate switching for packet switched radio bearers.
- Facilitating congestion control by taking the necessary steps in a congestion situation per cell (downswitching rate of packet switched users, block packet switched users, block circuit switched users).
- Enabling fully automatic hard handover to another frequency layer if available
- Enabling traffic load sharing between enabled frequency layers.
- Re-sorting cell ranking, accounting for uplink or downlink interference, while performing all the functions described, as those functions do have an impact on the uplink or downlink interference situation for most cells.

Determining Quick Convergence

The main parameters that define how fast a snapshot converges are:

- Number of users and user distribution
- Number of radio bearers in the traffic demand mix
- Number of fallback rates per radio bearer
- Number of cells and frequency layers available for connecting users
- Convergence limit
- Step size for the simulator
- Ranking algorithm

Initial Settings for Monte Carlo Simulator

The initial settings for the Monte Carlo simulator in WCDMA analysis are chosen to provide a rather fast convergence and acceptable accuracy (convergence limit 2 dB) for most projects and radio bearer combinations.

There may be projects that require adjustments to the initial settings, especially, large projects with:

- Many radio bearers
- Fallback rates
- Congested cells
- Interference based ranking
- User based convergence
- Small stepsize

It may be necessary to adjust the initial settings for the simulator, especially for large and complex networks.

Maximum Iterations for Monte Carlo Simulator

If the maximum iterations to run is set too low for the size of the project, results may seem less reliable. The initial setting is 50 iterations, but tests have shown that complex situations stretching the simulator to the limits need more iterations. In some cases, the required iterations to converge exceeded 100 iterations, but the simulator did find convergence.

Recommended Use of Simulator for Complex Networks

The following is a recommended approach for working with the simulator in complex network plans:

Task	Description
1.	Start with quick convergence and low accuracy to get a feeling for load and coverage in the network: • Run cell based convergence, convergence limit 2 dB, max. step size 2 dB, 50 iterations • Check that network load and capacity are reasonable for the cells and traffic demand defined • Perform necessary parameter adjustments in cells and traffic demand mix as required

Task	Description
2.	Increase accuracy of analysis: • Run user based convergence 90% users converged, start with max. 3 trials only, convergence limit 1 dB, max. step size 2 dB, max. number of iterations 100, ranking type Ec/Io • Check that the network converges and that user connection status (statistics output), load, and capacity are reasonable • Perform necessary parameter adjustments in cells and traffic demand mix as required
3.	Run final design with high accuracy: • Run user based convergence 100% users converged, 10 or more trials, convergence limit 0.5 to 1 dB, max step size 1 or 2 dB, max. number of iterations 100 or higher (depending on the average number of iterations required for task 2. above), ranking type Ec/Io • Watch the progress and convergence of the simulator for the first trial to make sure that the first trial converges • Check statistics and compare with what was achieved in task 2. • Check coverage and capacity for all radio bearers involved, process output

Option: Stringent Simulator Settings

For maximum accuracy and confidence in results, run an overnight simulation with more stringent settings for the simulator:

- User based convergence
- 100% users converged
- 0.5 dB convergence limit,
- Maximum step size 1 dB,
- Maximum number of iterations 500
- Ranking type Ec/Io
- Number of trials 50 or more

For details on how the parameter settings impact the speed and accuracy of a simulation, refer to the *WCDMA Technical Reference Manual*, Chapter 3, "Impact of parameter settings on WCDMA analysis".

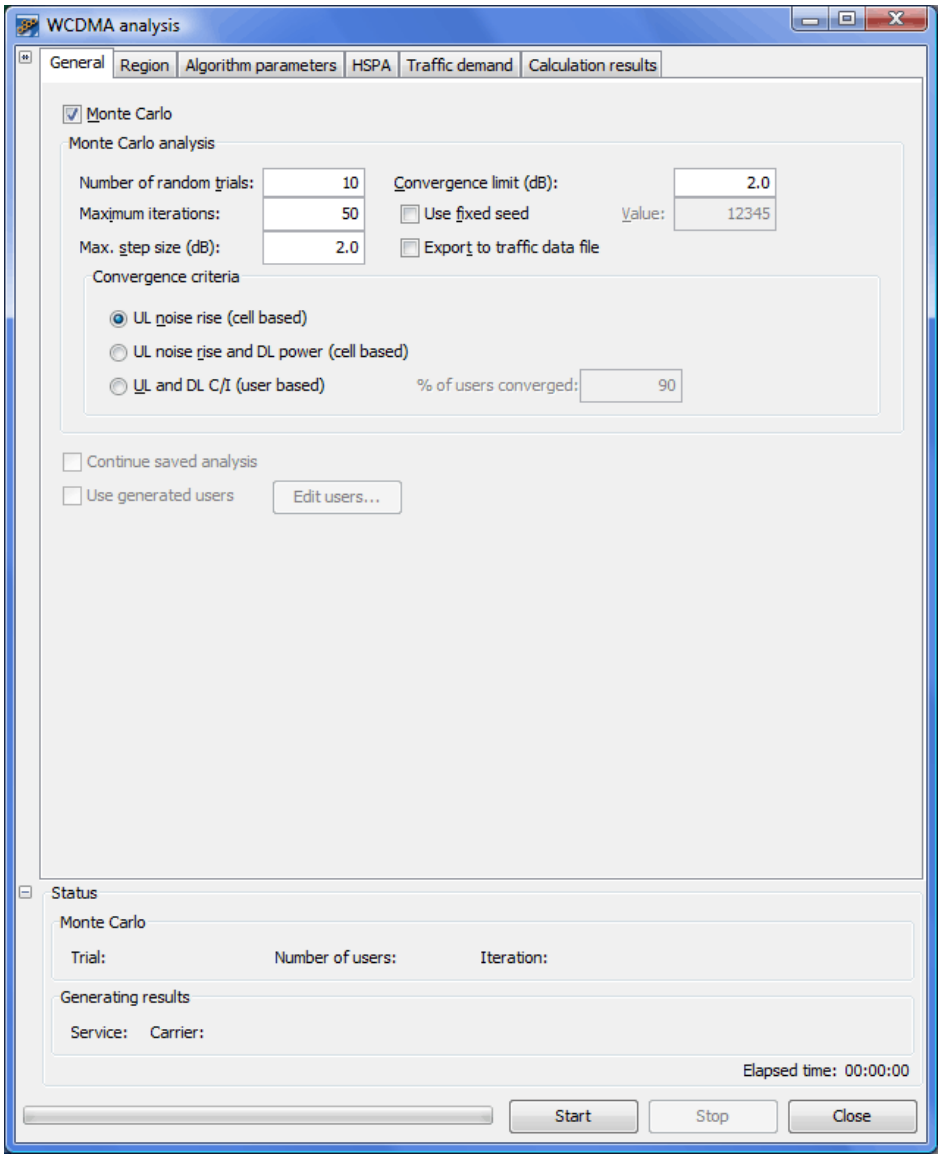
Set WCDMA Monte Carlo Analysis General Parameters

Set Scope of Analysis

In the **WCDMA analysis** window, limiting the analysis to a specific set of sites within a defined region can speed up the analysis and make the results easier to interpret.

Window to Use

Use the WCDMA analysis - General window to set Monte Carlo options.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Monte Carlo analysis	Enables iterative WCDMA analysis (Monte Carlo simulation).
Number of random trials	The number of trials to run for Monte Carlo analysis. The larger the number, the higher the statistical confidence in WCDMA analysis results. In the beginning of a network planning process about 10 trials give adequate statistical confidence. For higher accuracy the number of trials should be increased, especially in a final stage of the network planning process. To get statistically significant results it is recommended to run between 20 to 50 trials. For first estimates on network load and general WCDMA coverage about 10 trials provides a good result. The analysis process can take more time when the network plan and the random trials and iterations selected is large. Initial value = 10.
Max. number of iterations	The number of repetitions to run in each of the trials. Depending on convergence criteria and selected convergence limit, the required number of iterations changes until convergence is reached. For the most simple convergence criteria of uplink noise rise (cell based) approximately 5 iterations are sufficient. The most accurate convergence criteria of uplink and downlink C/I (user based) requires approximately 40 to 50 iterations before system convergence. When the maximum number of iterations is set too low for the selected convergence criteria, and WCDMA analysis does not get close to convergence, the first trial is repeated up to three times. If convergence cannot be reached, WCDMA analysis is interrupted so you can increase the maximum number of iterations. During an iteration, the uplink and downlink power settings are changed slightly to approach a stable system, where the uplink/downlink power setting and interference arrive at a steady state at the end of a trial. This steady state is also called *convergence*. Initial value = 50.

Field	Description
Max. step size (dB)	Maximum step size for power variations in dB in uplink and downlink that can be made by WCDMA analysis from one iteration to the next. The larger the step size, the faster the system may converge. A smaller step size means more iterations are required to reach convergence. The Monte Carlo simulator automatically adjusts the actual step size used for Tx power changes to ensure that the algorithm comes close to convergence last when the difference between the achieved and the target quality of the user connection is large. At convergence the algorithm adjusts the step size to a lower value to minimize the error in setting Tx power values. The recommended value for the maximum step size is 2 dB. Initial value = 2.0
Convergence limit (dB)	A delta value from the specified uplink/downlink Eb/Io values required for a WCDMA bearer to be set up. The value depends on the selected convergence criteria. For cell based convergence criteria it is recommended to set stringent requirements of 0.2 to 0.5 dB. For user based convergence criteria, a limit of 0.8 to 1.0 dB is acceptable. When the delta is reached, the link is considered to have converged to a steady state and the connection criteria for the WCDMA bearer is met. Using a smaller value for the convergence limit takes a longer time for the system to converge to a steady state, but the results are more accurate. Initial value = 2.0/
Use fixed seed	With this option, the random number generator always starts from the same starting value, leading to the same user distribution (seed) for all the consecutive trials and, consequently, to reproducible results for two or more runs of WCDMA analysis. This option allows re-use of the same subscriber distribution as in the previous trial. Normally the subscriber distribution changes from one trial to the next to simulate some mobility of subscribers. Use fixed seed disables changes to subscriber distribution during the simulation. Do not select this option to simulate different locations for users in the network for each trial.
Value	Defines the starting value for the random number generator that controls the procedure for distributing users in the network. Changing the value influences where the user generation function starts to distribute users in the network. It has a minor impact on final WCDMA analysis results.

Field	Description
Export to traffic data file	This option allows you to export statistical traffic data to a tab-delimited ASCII file in a format specified for the Ericsson transport network planning tool WCDMA Transporter. The file is written to: `C:\Users\<user id>\TEMSTCP\<version>\Home\Results\xxx.xxx\WCDMA\Channel-Independent\wcp_traffic.out` When Monte Carlo analysis completes, detailed statistical data is available for the subscribers using different WCDMA bearers. Detailed information on soft and softer handover status in each cell is available, and can be used as input to traffic analysis for transport network design. The results are written per RBS (site) and bearer (voice or best effort). The traffic data logged includes number of channel elements and number of users (in total and in handover state).
Convergence criteria	The convergence criteria used for running simulations: • UL noise rise (cell based) = UL convergence only, based on UL noise rise on cell level • UL noise rise & DL power (cell based) = UL and DL convergence, based on UL noise rise and DL power on cell level • UL & DL C/I (user based) - UL and DL convergence, based on UL and DL achieved C/I for all connected users (on per user level). For user based convergence criteria, you can select the percentage of users for convergence before the simulation is considered to have converged. Initial value = cell based.
% of users converged	For the UL and DL C/I (user based) convergence criteria, you can set the percentage of users for which convergence is reached before the trial is considered as converged. Normally 20% of the analysis time is required to get about 80% of the users to convergence. The remaining 20% of the users require about 80% of the analysis time, due to the rather small power and interference changes made during the later phase of the analysis and as more and more users become converged. Initial value = 90%.
Continue saved analysis	Allows you to save partial analysis results when you stop WCDMA analysis or close the WCDMA analysis window. WCDMA analysis continues with the next iteration based on the saved partial results of the previous analysis.

Field	Description
Use generated users	Allows you to re-use the same user distribution that was used in the previous run of the Monte Carlo analysis. Use this option to compare simulations with slightly different parameter settings but based on the same traffic demand and user distribution. The previously generated users can be re-used for only one trial. Several trials cannot be run on the previously defined user distribution. To re-use the same user distribution for all trials select **Use fixed seed**.
Edit users	Allows you to manually edit the latitude and longitude of the position of users in the network. You must have previously run a Monte Carlo analysis so that a user distribution is already available.

Set WCDMA Monte Carlo Analysis Region Options

Use the **WCDMA analysis - Region** window to confine or extend WCDMA analysis to a defined region. If you have pre-defined one or more analysis regions in the **Area editor** you can run WCDMA analysis for the area only.

Prerequisites

A precondition for WCDMA analysis in a selected region is that all cells in the region must be covered by pathloss prediction and CPLM. The pathloss and CPLM analysis results cover both the analysis region and a possible extended region, since the information is vital input to WCDMA analysis.

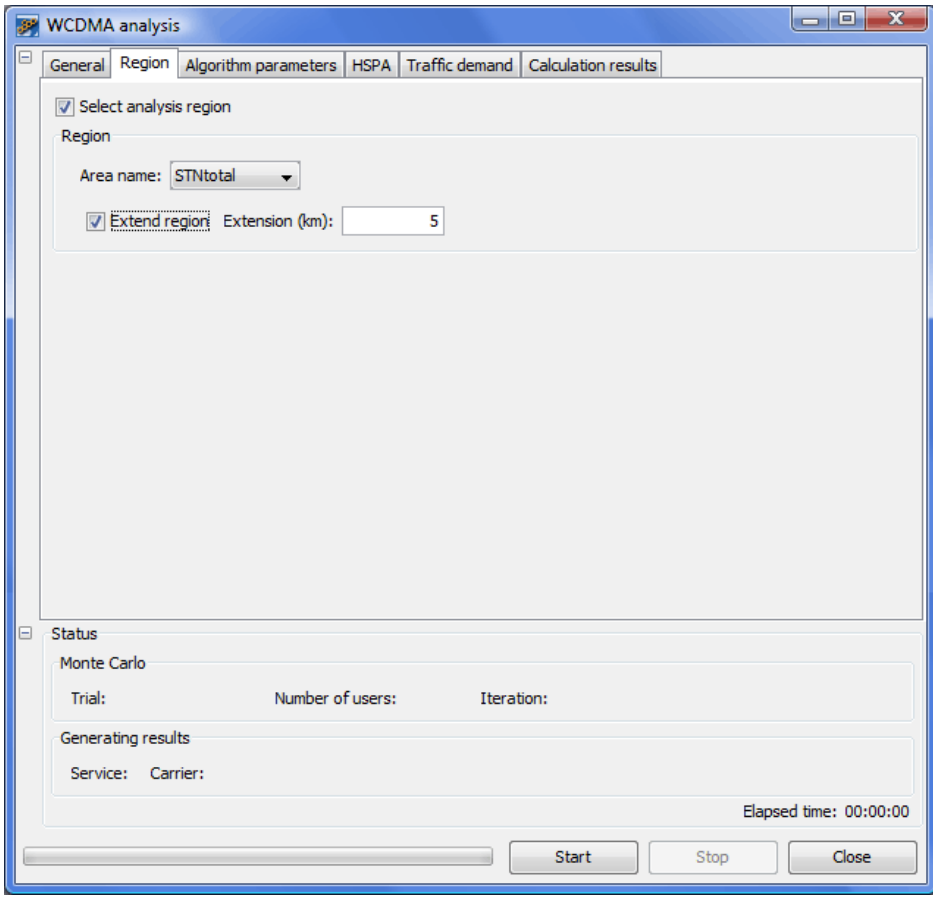
Extending the Analysis Region

You can extend the analysis region by a specified distance to consider the impact of radio transmitters (base stations and terminals) placed next to the pre-defined analysis region. Extending the range of the analysis allows you to consider interference from neighbor areas, rather than considering the analysis region as an isolated area.

It is suggested to always use the extended region when running WCDMA analysis in a limited area. The users are distributed within the extended part of the analysis region and interference contributions from the extended areas is considered by WCDMA analysis. If you do not extend the region, the analysis are is treated as an isolated area without any surrounding cells and users that would contribute to the interference in the network.

Window to Use

Use the **WCDMA analysis - Region** window to set regional options for analysis.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Select analysis region	Selects a region (a pre-defined) area to use for the analysis. The region you select must have been pre-defined with the area editor before it can be selected.
Area name	The name of a defined area available from a list of areas.
Extend region	Extends a defined region by a given distance.
Extension (km)	The distance of the extended region. The suggested extension in kilometers is approximately twice the average site-to-site distance of the analysis region, in the range of 0.0 to 100.0 km in the field. Each side of the distribution region becomes extended by the entered value.

Set WCDMA Monte Carlo Analysis Algorithm Parameters

Use the WCDMA analysis - Algorithm parameters window to set the factors that control how the WCDMA analysis algorithm performs.

Relative Pilot Pollution Threshold

You can set a relative threshold on the minimum Ec/Io for a cell relative to the Ec/Io of the best serving cell in the bin to be considered a pilot polluter. The threshold operates according to the formula:

Ec/Io (pilot polluter candidate) > minimum pilot pollution threshold

AND

Ec/Io (pilot polluter candidate) > Ec/Io (best serving cell) - relative pilot pollution threshold

Example:

Minimum pilot pollution threshold = -24 dB
Relative pilot pollution threshold = 6 dB
Ec/Io of the best serving cell = -14 dB

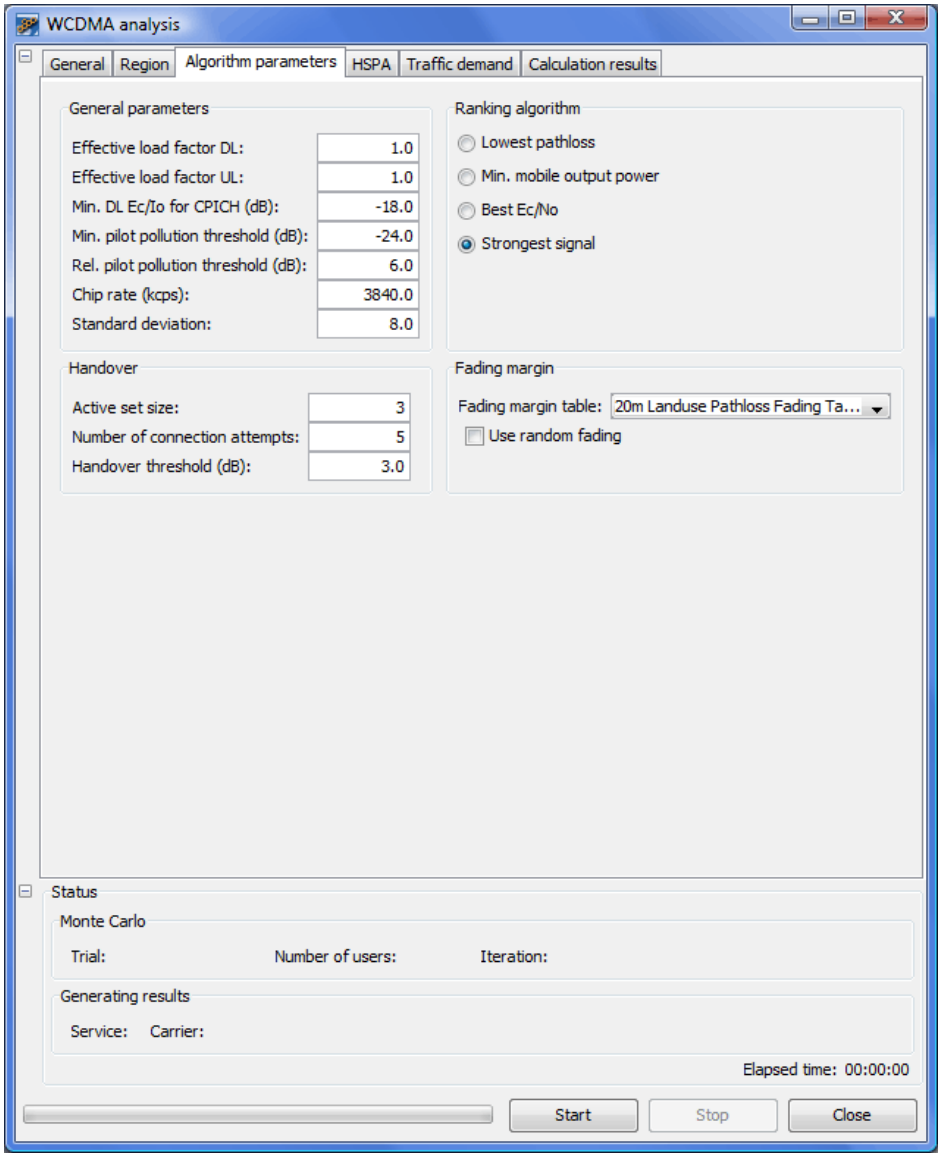
The pilot polluter candidate is a pilot polluter if:

Ec/Io > max of {-24 dB, -14 -6 dB}, that is Ec/I0 > - 20 dB

Pilot polluters are displayed in the Pilot Polluters Count plot, 14-28.

Window to Use

Use the **WCDMA analysis - Algorithm parameters** window to set values for the algorithm parameters.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Effective load factor DL	To simulate effective load factor, also called Tx-increase, you can increase the overall downlink load for the network plan. In the Monte Carlo simulations, the DL traffic load values are scaled according to the value set here. This parameter applies effects of short term power variations on the DL interference due to strong multipath propagation. Short-term fading under strong multipath propagation conditions can lead to an average power increase of the transmitters. An increase in effective load factor has an impact on the overall cell load and is considered by the admission and congestion control algorithms. A suggested value for simulating the strong fading is 1.1 to 1.2, a 10% to 20% load increase due to the strong multipath fading and imperfections in power control. *Examples*: • A value of 1 implies that the DL load as seen by admission and congestion control is equal to the calculated load. • A value of 1.2 implies a 20% increase in the DL load as seen by admission and congestion control compared to the calculated DL load.
Effective load factor UL	Applies effects of short term power variations on the UL interference due to strong multipath propagation. An increase in effective load factor has an impact on the overall cell load and is considered by the admission and congestion control algorithms. *Examples*: • A value of 1 implies that the UL load as seen by admission and congestion control is equal to the calculated load. • A value of 1.2 implies a 20% UL load as seen by admission and congestion control compared to the calculated UL load.

Field	Description
Min. DL E_C/I_O for CPICH (dB)	The minimum required pilot channel quality for the mobile to perform measurements on CPICH, needed for handover and service coverage evaluation. The chip-energy to interference ratio is required for the pilot channel to support the downlink. This value sets the minimum required CPICH quality for the mobile terminals to correctly detect and decode the pilot channel of any cell. It is used in the analysis to evaluate user connection criteria. Only if the user position is covered by a sufficiently strong pilot signal a connection attempt can be made from that position. CPICH coverage plots depend on this parameter, since they present a quality margin (Ec/Io margin) relative to the minimum downlink Ec/Io for CPICH entered here. Initial value = -18 dB.
Min. pilot pollution threshold (dB)	The cells with an Ec/Io above this threshold are pilot polluter candidates. The analysis algorithm evaluates all cells, except for the cells belonging to the active set, and cells with an Ec/Io below Minimum pilot pollution threshold. To further reduce the number of pilot polluters a relative pilot pollution threshold is also considered. Initial value = -24dB.
Rel. pilot pollution threshold (dB	The limit on the minimum Ec/Io for a cell relative to the Ec/Io of the best serving cell in the bin to be considered a pilot polluter. Initial value = 6 dB.
Chip rate (kcps)	The chip rate of the radio system. Used to calculate the processing gain for different WCDMA bearers. Defines the noise floor level in the receivers of the network. The larger the chip rate and the bandwidth of the radio system, the more noise is picked up and the higher becomes the background noise floor level. Changing this value has an impact on the processing gain considered for the system. The 3GPP standard chip rate for WCDMA systems is 3840 kcps or 3.84 Mcps. If you have a standard WCDMA system, do not change this parameter. Initial value = 3840 kcps.
Standard deviation	The default log normal standard deviation used when generating the plots "UL/DL coverage probability". This value is used when the standard deviation found in the pathloss fading table for the land use code for a specific bin is below 3 dB. Range: 3 - 20. Initial value = 8.

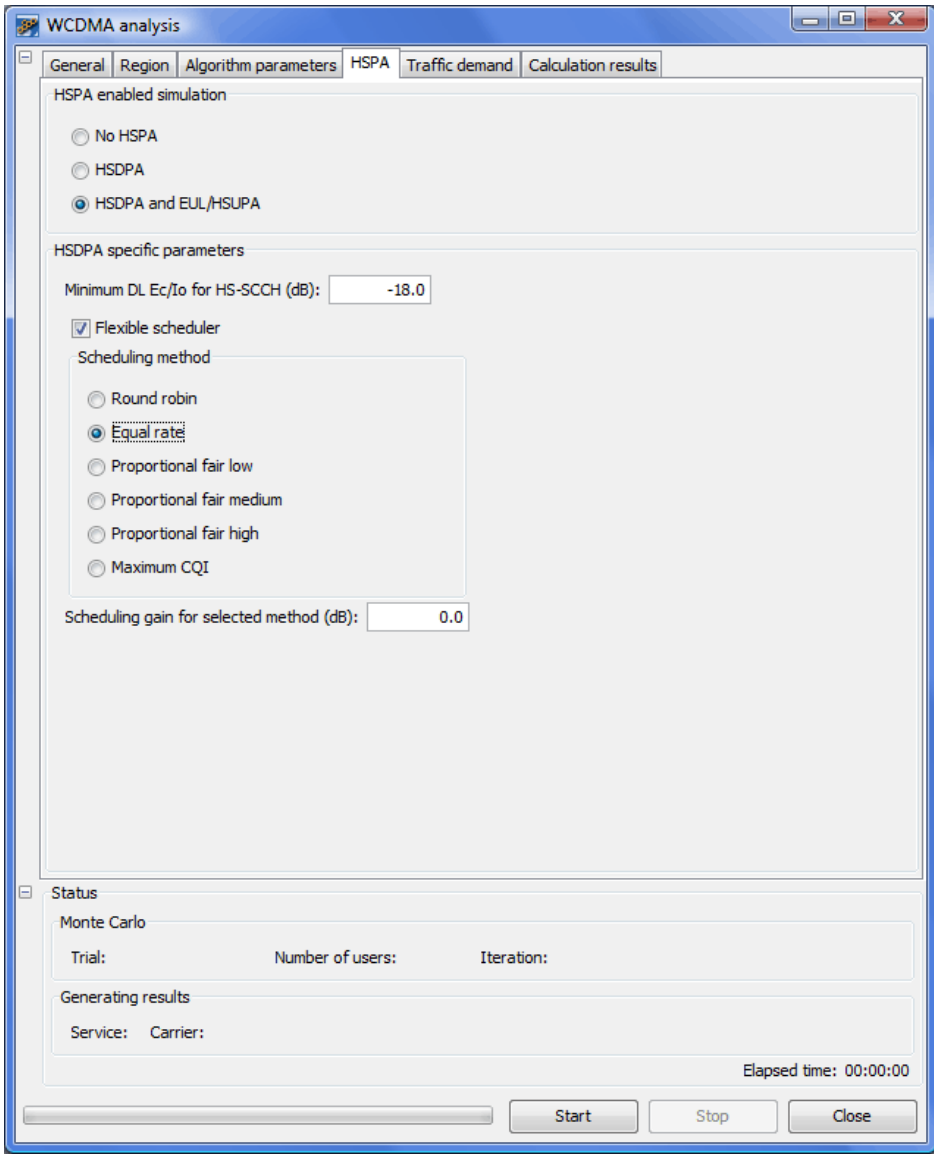
Field	Description
Active set size	Defines the maximum cells a mobile terminal can be connected to simultaneously in any position in the network in soft or softer handover. The pre-condition for being included in the active set is that the quality difference of all cells in the ranking list is within the limits as defined by the Handover threshold. Initial value = 3.0
Number of connection attempts	The maximum cells that a mobile terminal can try for a connection to the network. If the terminal does not succeed in getting a connection to the network within the specified limit, it is disconnected permanently for the duration of that trial. In the next trial, a new series of connection attempts is made. The more connection attempts allowed, the longer WCDMA analysis takes to converge. Sorted according to the selected ranking algorithm. Initial value = 5
Handover threshold (dB)	Threshold value for the pilot channel quality (Ec/Io), and the maximum difference in CPICH quality that is allowed for all cells in soft or softer handover. Increasing the handover threshold higher than the initial value implies a risk for handover failures in the real network. Initial value = 3 dB.
Ranking algorithm type	Ranks the cells according to the way the network would connect users, based on algorithm type: Lowest pathloss - The cell with the lowest pathloss ranked first (initial setting). Min. mobile output power - The cell requiring the least mobile output power ranked first. Best E_C/N_O - The cell with the highest E_C/N_O for the pilot channel ranked first. Strongest signal - The cell with the highest pilot signal strength ranked first.
Fading margin table	List of available pathloss fading tables. During analysis, TEMS CellPlanner uses a fading margin value from the applicable land use category.
Use random fading	Enables assignment of random fading values to individual radio links during Monte Carlo simulations.

Set WCDMA Monte Carlo Analysis HSPA Parameters

Use the WCDMA analysis - HSPA window to set analysis parameters for the HSPA option.

Window to Use

Use the WCDMA analysis - HSPA window to set parameter values:



Fields on the Window

The following table describes the fields on the window:

Field	Description
HSPA enabled simulation	Enables simulation of HSDPA users in the network. Options are: • No HSPA • HSDPA • HSDPA and EUL/HSUPA
Min. DL E_c/I_o for HS-SCCH	The minimum required pilot channel quality in dB of the HS-SCCH required by the terminal to detect the HS-SCCH correctly and to be able to set up a connection on the HSDPA channels. The chip-energy to interference ratio is required for the pilot channel to support HSDPA traffic. Min = 30 dB, Max = 0.0 dB, Initial value = -18 dB.
Flexible Scheduler On	Turns on flexible scheduling so you can choose one of several scheduling methods.

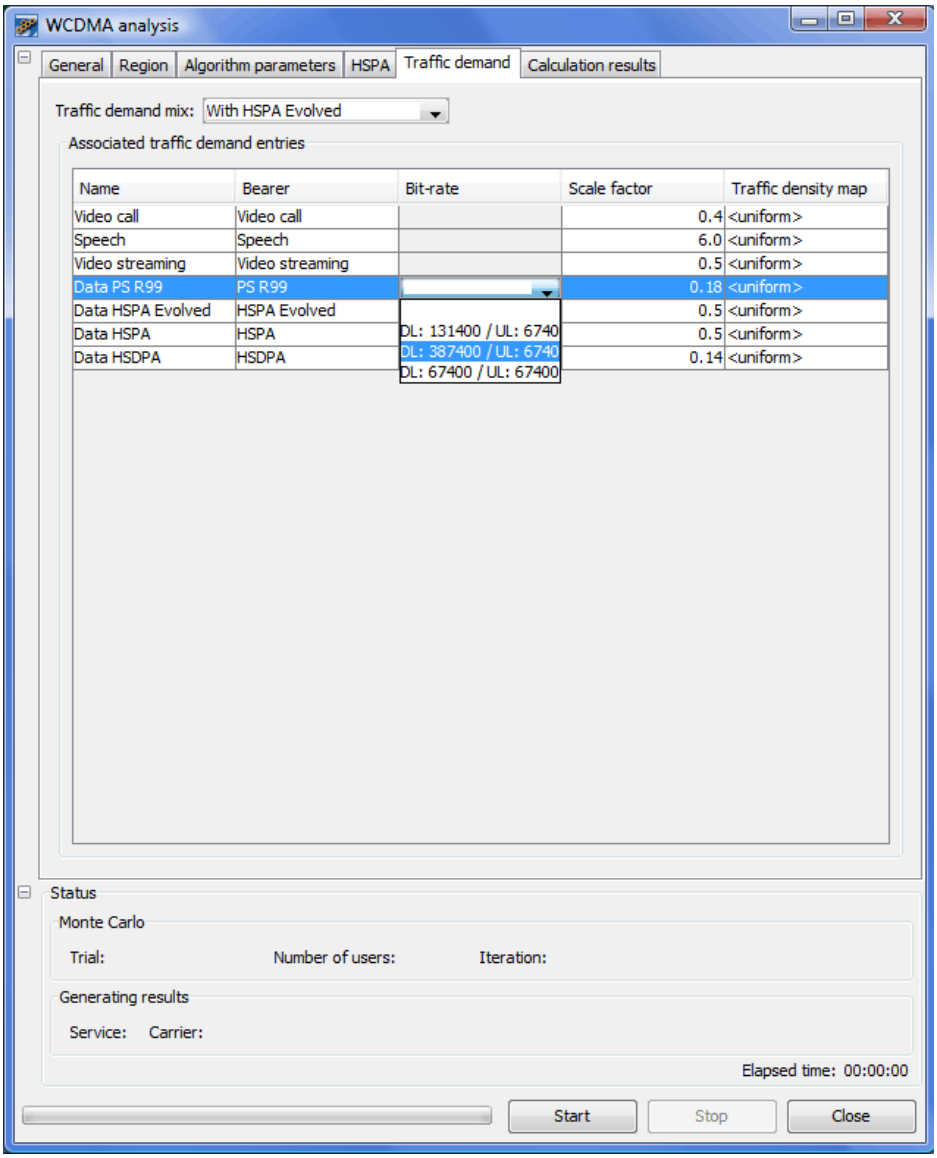
Field	Description
Scheduling method	The scheduling method for the simulation. TEMS CellPlanner uses the Round Robin scheduling method as the initial setting. *Note: Proportional fair is the recommended scheduling method for shared HSPA channels. If this scheduling method is activated in the real HSPA cell, you should also use it in the simulation to obtain higher throughput.* Available scheduling methods: • Round robin - Assigns downlink traffic to users in a sequential order (initial setting) • Equal rate - • Proportional fair low - Assigns downlink traffic to users by considering previous received downlink rates and current signal quality. • Proportional fair medium - Assigns downlink traffic to users by considering previous received downlink rates and current signal quality. • Proportional fair high - Assigns downlink traffic to users by considering previous received downlink rates and current signal quality. • Maximum CQI - Assigns downlink traffic to users by considering only current signal quality.
Scheduling gain for chosen method	The difference in dB between the received signal quality under favorable conditions and the average received signal quality. If the scheduler is able to schedule the transmission to each subscriber to a time in which the subscriber has favorable fading conditions, a DL scheduling gain can be achieved. Depends on vendor specific implementation of scheduling algorithms in the system equipment. Min = -10, Max = 10, initial value = 0. HSDPA initial value: 2

Set WCDMA Monte Carlo Analysis Traffic Demand Parameters

Use the WCDMA analysis - Traffic demand window to select the pre-defined traffic demand mix to use in the traffic analysis by WCDMA algorithms, and control the bit rates to use for plot generation for packet-switched WCDMA bearers with fallback rates. WCDMA analysis simultaneously considers all traffic types and demand values defined in the traffic demand mix.

Window to Use

The **WCDMA analysis - Traffic demand** allows you to set parameters for analyzing traffic demand:



Fields in the Window

The following table describes the fields in the window:

Field	Description
Traffic demand mix	Pre-defined traffic demand mix to use in WCDMA analysis (defined in the System explorer)
Name	Name for the traffic demand belonging to a selected WCDMA bearer.
Bearer	Name of the WCDMA bearer for a particular traffic demand within the selected traffic demand mix.
Bit rate	Bit rates available for the WCDMA bearer to use for plot generation. • Fixed bit rate bearers - the only bit rate is displayed. • Fallback rate bearers - select among rates. For fallback rate bearers, you can base plot generation on any of the rate sets defined for the bearers. When you do not select a specific rate set, the plots are based on all available rate sets. You can see the effect of channel rate switching in the coverage plots. Selecting no rate means that the algorithm always tries to connect all users on the highest possible rates available. This is the recommended setting.
Scale factor	The traffic demand scaling factor of the selected traffic demand. • If the traffic demand is based on a certain traffic demand map, then that traffic is scaled according to the selected scaling factor. • If you selected an uniform distribution of users for the WCDMA bearer, the *scaling factor = the number of simultaneous users per square kilometer*.
Traffic density map	Name of the selected traffic density map for the traffic demand. If the traffic demand is based on uniform distribution, the word *uniform* is displayed instead.

Set WCDMA Analysis Calculation Results Parameters

Use the WCDMA analysis - Calculation results window to select the plots and plot options to generate during WCDMA analysis for further evaluation. You can de-select plots that are not of interest to increase the speed of WCDMA analysis. You can select different criteria for generating plots for the uplink and downlink.

Multiple Frequency Layers

When the network plan consists of more than one frequency layer, you can select the layers to include for plot generation. WCDMA analysis is always run on all frequency layers that you define (on the WCDMA cell level) and enabled (by assigning a transmit power to those cells) in the network.

Percentile Results

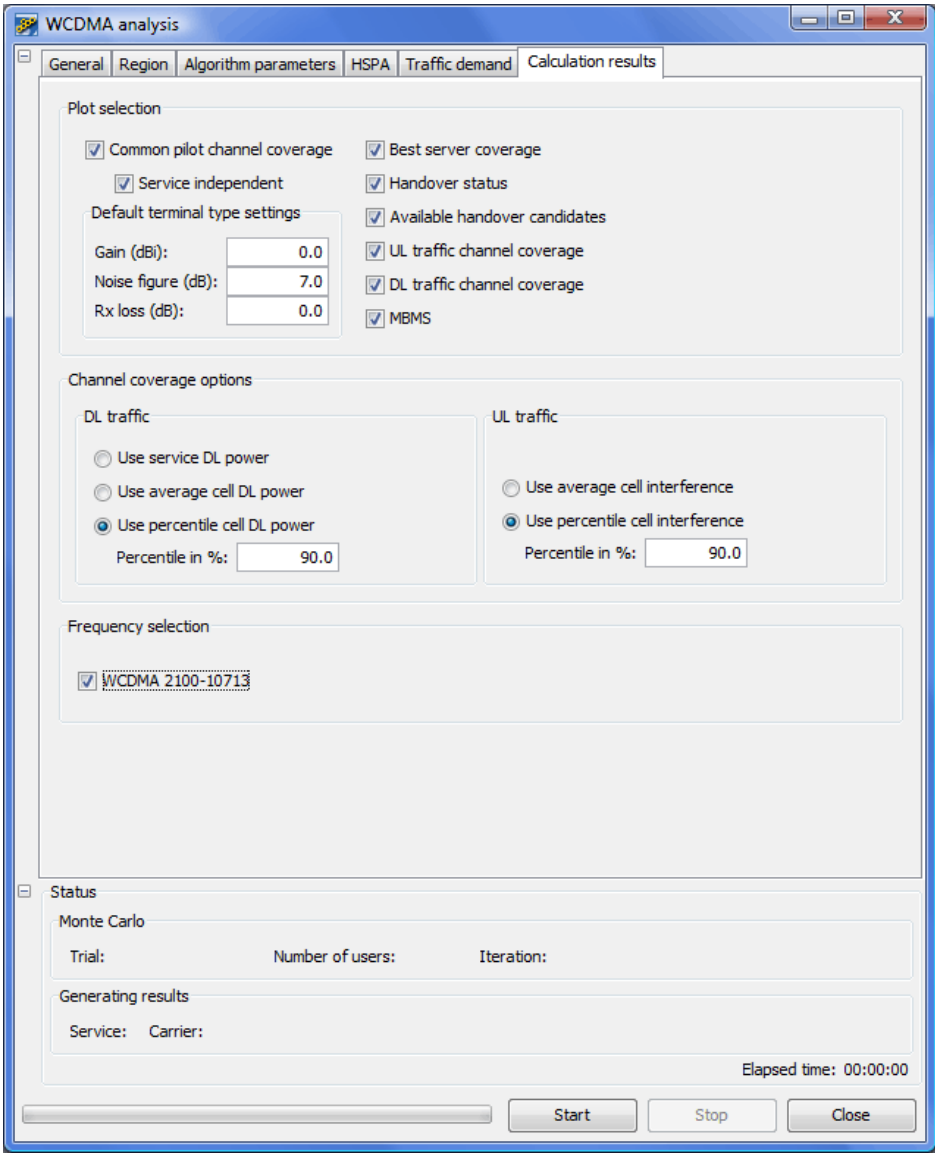
When you select calculation results calculated on percentile, the application bases the uplink and downlink plots on the percentile value for all trials of the analysis. Since statistics from all trials are available when the last trial has been run, you can choose the results plots to be based on a percentile rather than an average value.

For example, you may select the 90th percentile for running the plot generation with the following results:

- Downlink coverage plots are based on the 90th percentile of downlink power, resulting in coverage seen statistically as better than for the calculated average (50th percentile) of the cell downlink power.
- Uplink coverage plots are based on the 90th percentile of the uplink interference for each cell, resulting in coverage seen statistically as worse than for the calculated average (50th percentile) of the cell UL interference.

Window to Use

The **WCDMA analysis - Calculation results** allows you to specify the calculation results:.



Fields in the Window

The following table describes the fields in the window:

Field	Description
Common pilot channel coverage	Generates plots for CPICH coverage, with and without fade margin, as well as RSCP plots.
Service independent	Generates service independent result plots.

Field	Description
Default terminal type settings	Settings of a default terminal type used to simulate Service independent traffic, including: • Gain (dBi) - antenna gain, 0-100 dBi, default = 0 dBi • Noise figure (dB) - noise level of the terminal, 0-40 dB, default = 7 dB • Rx loss (dB) - sum of losses (body, building penetration, feeder) between terminal and external antenna, 0-50 dB, default = 0 dB
Best server coverage	Generates best server coverage plots and plots that can be associated to best server cells, such as cell load, frequency efficiency factors, user connection status, and so forth.
Handover status	Generates handover plots and statistics, showing details on various handover states in the network plan.
Available handover candidates	Generates plots based on available handover candidates.
UL traffic channel coverage	Generates plots based on UL traffic channel coverage in terms of MEIRP margin and UL bit rate.
DL traffic channel coverage	Generates plots based on DL traffic channel coverage in terms of EIRP margin and DL bit rate.
MBMS	Generates MBMS plots
DL traffic	DL traffic channel coverage options, including: • Use service DL power - Generates plots based on the service DL power as specified in the WCDMA bearer properties. Initial setting. • Use average cell DL power - Generates plots based on the calculated average cell DL power. • Use percentile cell DL power - Generates plots based on the percentile of cell DL power entered. Initial value = 90%.
UL traffic	UL traffic channel coverage options, including: • Use average cell interference • Generates plots based on the calculated average cell interference. Initial setting. • Use percentile cell interference • Generates plots based on the percentile of cell interference entered. Initial value = 90%.
Frequency selection	Frequency band and UARFCN for which to generate plots. Selecting the frequency determines plot generation and does not affect frequencies considered by WCDMA analysis. De-selecting a frequency layer means that plots will not be generated for that layer.

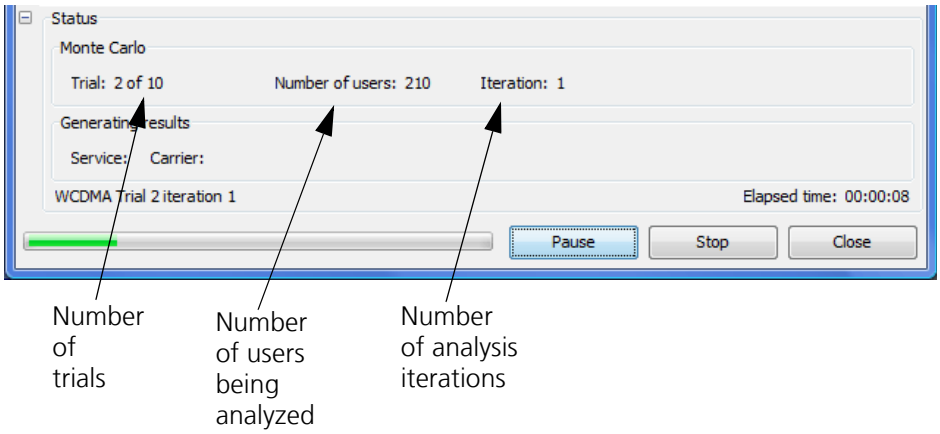
Run WCDMA Analysis with Monte Carlo Simulations

Prerequisites

Before starting WCDMA analysis, you must calculate pathloss and composite pathloss (CPLM). WCDMA analysis requires the calculations of those processes to complete the analysis.

Window to Use

The following example shows the **Status** area of the **WCDMA analysis** window with status information about the Monte Carlo simulation:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Monte Carlo status	Displays the current status of WCDMA analysis, such as current trial and iteration, and number of users.
Generating results	Displays the WCDMA bearer and frequency layer for which the result plots are being generated.
-/+ (collapse window area)	Allows you to collapse the input and status fields to save display area. Only the progress bar is displayed in collapsed mode.
Start	Starts WCDMA analysis
Stop	Interrupts WCDMA analysis. You can save the partial calculation results and continue with the same analysis later.
Close	Interrupts WCDMA analysis and closes the window. You can save the partial calculation results and continue with the same analysis later.

Procedure

After you enter the analysis options and settings, follow these steps to run the analysis:

1. Select Analysis↗WCDMA↗Analyze WCDMA.
2. Make entries in each window as required.
3. Click Start. The analysis process starts. The window displays the status of the process in the Status area.
4. Monitor the process in the Status area of the WCDMA analysis window to be sure that all iterations of the analysis run correctly.
5. When the analysis is complete, the Status area displays "Done". Use the Result plots option on the Analysis menu to view the results of WCDMA analysis.

   To stop WCDMA analysis before it completes, click Stop.

   To close the window before or after running WCDMA analysis, click Close.

Saving Analysis Results for Later Use

If you stop the Monte Carlo analysis or close the WCDMA analysis window before the Monte Carlo analysis completes, a dialog is displayed confirming whether or not to save the partial calculation results.

To continue WCDMA analysis later and use results generated from previous trials and iterations, select Yes. To disregard partial results of the interrupted analysis, select No.

If you select Yes, the status of the analysis at the time of interruption is saved. To re-start the analysis using saved results, select Continue saved analysis in the WCDMA analysis - General window.

About Non-Iterative Analysis

Non-iterative analysis allows you to enter cell based UL and DL load values and to quickly estimate WCDMA coverage and capacity for different bearers. The analysis provides detailed plots on estimated coverage for pilot and traffic channels as well as handover and interference plots.

To run non-iterative WCDMA analysis you must estimate the expected UL and DL load in each cell of the planned network. Such information is usually found in applications containing MS Excel based coverage and capacity estimates.

Non iterative analysis is performed for each WCDMA bearer and across all bins in the analysis region. The process is carried out as follows:

1. The target C/I is set for both the downlink and the uplink for the WCDMA bearers in the traffic demand mix and based on the WCDMA bearer property settings.
2. For each bin in the analysis region, the algorithm computes the following parameters:
   - Pilot channel downlink EIRP margin
   - Uplink transmission power
   - Downlink transmission power
   - Downlink traffic channel coverage
   - Uplink traffic channel coverage
   - Best server coverage

Non-iterative analysis does not involve convergence toward a specified DL power or UL interference per cell. It is based on the values entered in the UTRAN cell analysis parameters accessed from the WCDMA RBS explorer.

Output of Non-Iterative Analysis

Non-iterative analysis provides detailed plots on estimated coverage for pilot and traffic channels as well as handover and interference plots.

UL and DL Load Values for Cells

You must enter the uplink and downlink load values for all cells to include in the analysis. The plots and reports generated are determined by these values.

Follow the procedures described in Chapter Define UTRAN Cell Analysis Parameters, 3-58, to enter load values for cells.

Fading Margins and Non-Iterative Analysis

For non-iterative analysis, it is recommended to apply fading margins only in the areas that belong to the coverage border of the WCDMA network. Within the

coverage area of the WCDMA network, it is not recommended to apply any major fading margins, since handover gain from soft and softer handover compensates for log-normal fading.

When no detailed values exist for fading margins to apply to WCDMA planning your network coverage area, the following initial values could be applied:

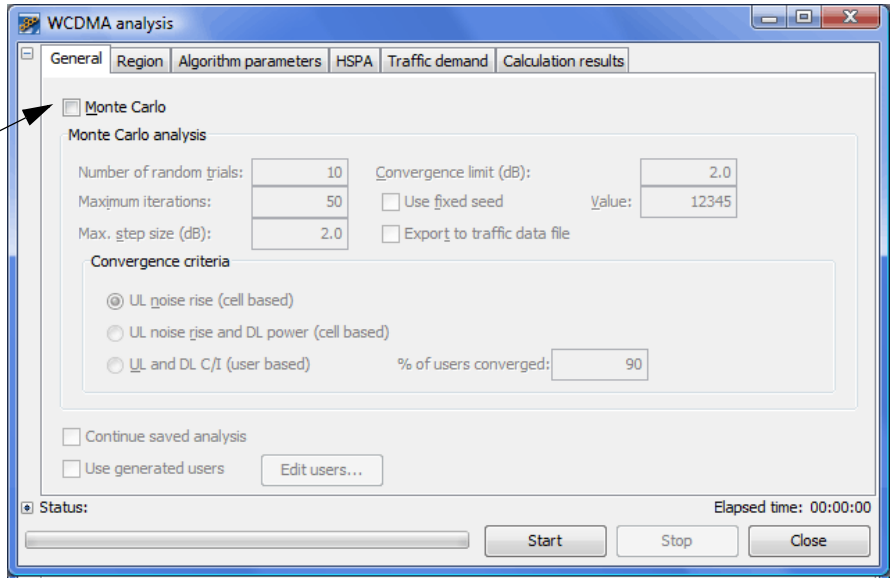
Environment	σLNF (dB)	Area Coverage (%)		
		90	95	98
Rural, suburban	6	0.5	1.5	3.5
Urban	8	0.9	2.7	5.3
Dense urban, suburban indoor	10	1.5	5.1	7.9
Urban indoor	12	2.8	6.5	11.2
Dense urban indoor	14	3.7	8.5	13.4

Disable Monte Carlo Option

When you disable Monte Carlo, the simulator in WCDMA analysis is switched off and plot generation is determined by:

- Parameters set on other tabs of the **WCDMA analysis** window
- UL and DL load values entered for cells in the WCDMA RBS explorer

Make sure Monte Carlo is not selected



The non-iterative analysis uses the same basic algorithms for generating the output plots as WCDMA analysis, based on Monte Carlo simulations. Consequently, the same recommended parameter settings and limitations described for the iterative WCDMA analysis apply also here.

Non-iterative analysis does not produce any statistical reports, nor are discrete subscriber plots available from this mode of WCDMA analysis.

7
Using Automatic Network Analysis

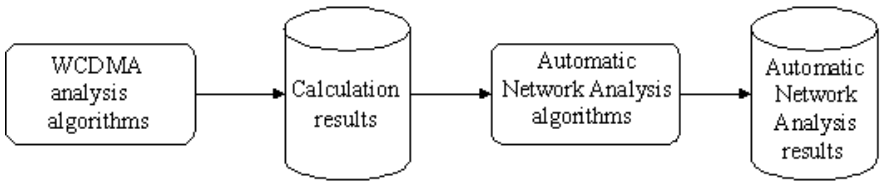
This chapter describes how to use automatic network analysis to analyze network performance.

Topics **Page**

Background of Automatic Network Analysis 7-2
Prerequisites for Automatic Network Analysis 7-3
Run Automatic Network Analysis. 7-4
View Results of Automatic Network Analysis 7-6

Background of Automatic Network Analysis

Automatic network analysis improves the efficiency and ability to analyze network performance. Automatic network analysis uses the results of WCDMA analysis functions to analyze network performance, as shown in the following diagram:

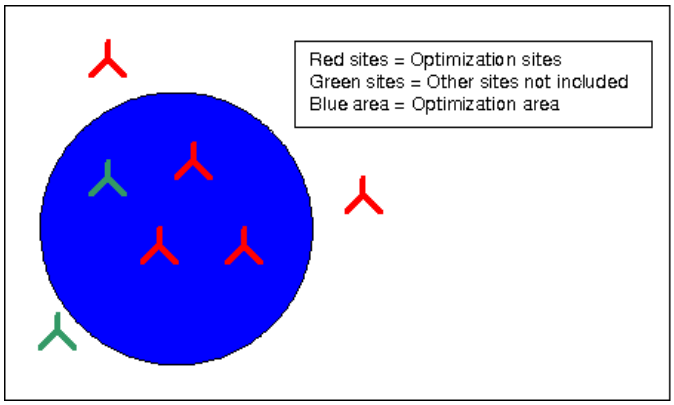


Cell Contribution Determined

During network analysis, the cell contribution analysis determines which cells cover most areas. This information is used when deciding the sites to optimize and can be used to solve interference problems.

Relationship between Analysis Area and Sites

The optimization sites do not have to be within the optimization area, as shown in the following illustration of the relationship between analysis area and sites:



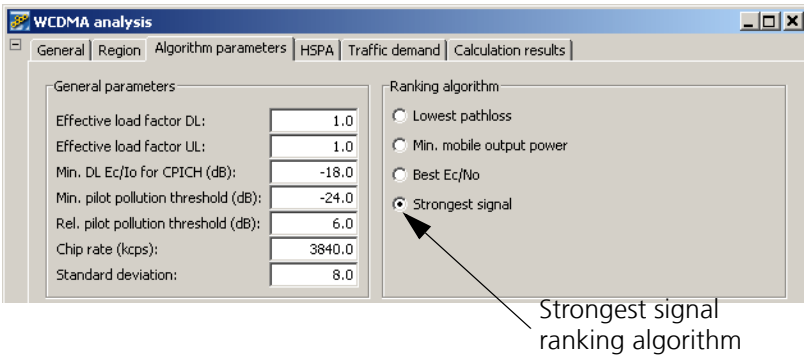
Output of Automatic Network Analysis

The output of the function is an Excel spreadsheet consisting of tables that show how many bins a cell has been found within the hysteresis margin.

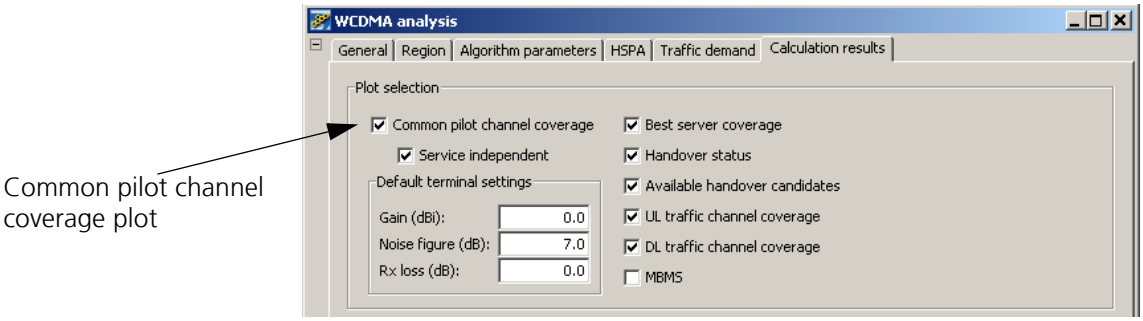
Prerequisites for Automatic Network Analysis

The following prerequisites must be met before you can run Automatic Network Analysis:

1. Run pathloss and CPLM calculations for the cells and area to include in the analysis.
2. Run WCDMA analysis for the cells to be analyzed, or select an area. When running WCDMA analysis:
   - Select the strongest signal in the **Algorithm parameters** window, as shown in the following example:



   - Do *not* select Monte Carlo analysis.
   - Include **Common pilot channel coverage** in the plots on the **WCDMA - Calculations results** window, as shown in the following example:



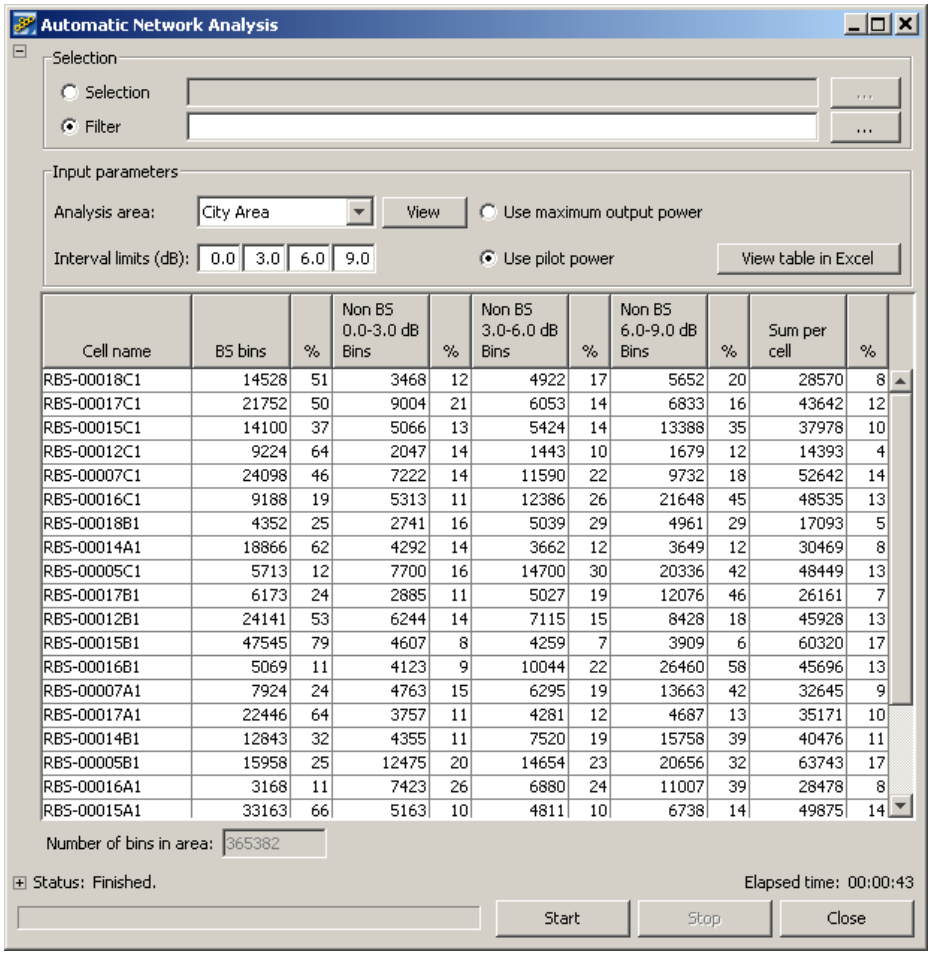
3. Define the analysis area where the bins should be analyzed.

Run Automatic Network Analysis

Use this procedure to run automatic network analysis.

Window to Use

Use the Automatic network analysis window to analyze a network for performance:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Analysis area	The predefined area to use for the network analysis.
View	Displays the analysis area in the map window
Use maximum output power	Uses the maximum defined output power for the analysis possible defined power or the pilot power.

Field	Description
Interval limits (dB)	The intervals in dB below the best server that the cell should be within to be seen in the result. For example, if you enter 0,3,6, and 9 as the intervals limits, the intervals are 0-3, 3-6 and 6-9dB below best server. In this case all cells that have a signal strength in any of these intervals below the best server in the optimization area are displayed in the result view.
Use pilot power	Uses the maximum defined output power for the analysis possible defined power or the pilot power.
View table in Excel	Allows you to view the results in Excel spreadsheet format.
Number of bins in area	The number of bins for each defined cell is counted for the Best server area as well as for any intervals defined where the cell is not the best server.

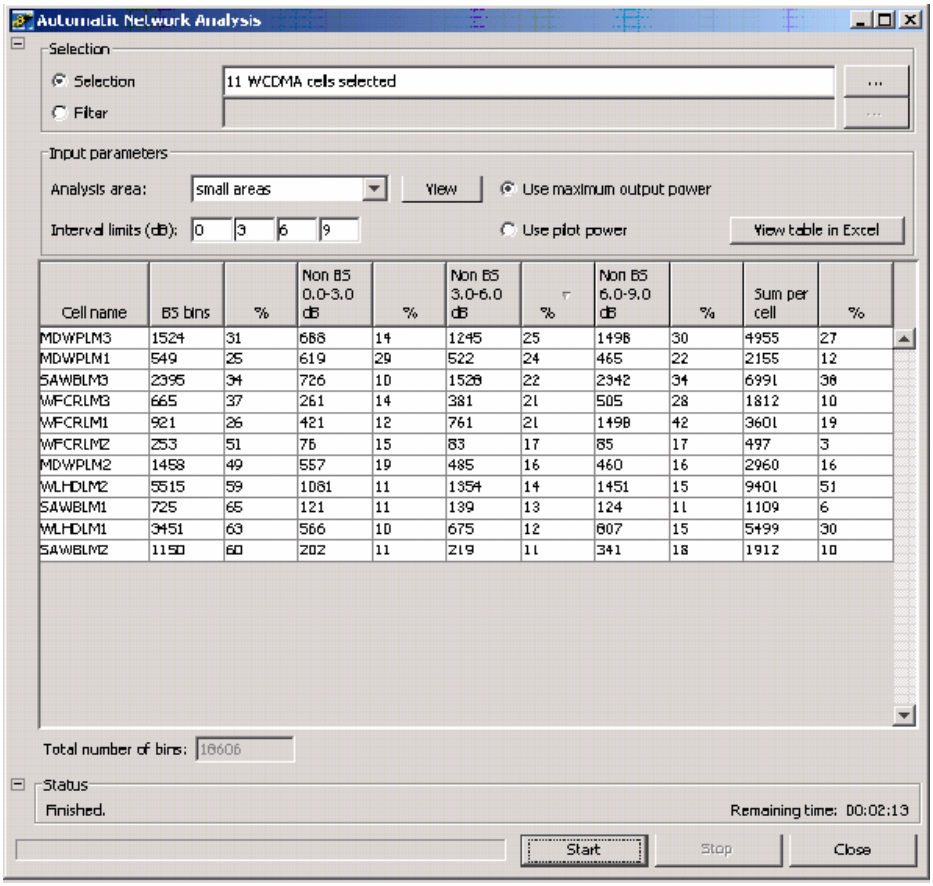
Procedure

Follow these steps to run automatic network analysis:

1. Select the sites to analyze using a polygon or a predefined area.
2. Define the interval limits as the user which. A suggestion could be to at least include one interval outside the active set window (3dB).
3. Select either to use the max output power, or the pilot output power to be used in the analysis.
4. Click **Start**.

View Results of Automatic Network Analysis

To view the results of automatic network analysis, keep the window open until the process completes. The results are displayed in the same window, as shown in the following example:



Fields in the Window

The following table describes the fields in the window:

Field	Description
Cell name	Name of the cell that contains bins as best server or in any of the intervals in the optimization area.
BS bins	Number of bins where the cell is the best server.
BS bins %	Percentage of all bins where the cell is the best server or in any of the intervals in the optimization area where the cell is the best server.
Non BS 0.0-3-0dB	Number of bins where the cell is between 0 and 3dB below the best server in the optimization area.

Field	Description
Non BS 0.0-3-0dB %	Percentage of all bins where the cell is the best server, or in any of the intervals in the optimization area, where the cell is between 0 and 3dB below the best server in the optimization area.
Non BS 3.0-6.0dB	Number of bins where the cell is between 3 and 6dB below the best server in the optimization area.
Non BS 3.0-6.0dB %	Percentage of all bins where the cell is the best server, or in any of the intervals in the optimization area, where the cell is between 3 and 6dB below the best server in the optimization area.
Non BS 6.0-9.0dB	Number of bins where the cell is between 6 and 9dB below the best server in the optimization area.
Non BS 6.0-9.0dB %	Percentage of all bins where the cell is the best server, or in any of the intervals in the optimization area, where the cell is between 6 and 9dB below the best server in the optimization area.
Sum per cell	The sum of all bins as a best server or in any of the specified intervals in the optimization area.
Sum per cell %	The percentage of bins specified for the cell as the best server, or in any of the specified intervals, compared to the total bins in the optimization area.
Total number of bins	Total number of bins analyzed.

Procedure

1. Click in a cell of the header of the table.

   For example, to sort the NON BS 3-6dB (%) in descending order and compare the percentage with the percentage where this cell is the best server. If the cell is in the interval 3-6dB below the best server in much more bins than it is the best server, then this should be analyzed further.

8
Using the ACP Wizard

This chapter describes how to use the ACP wizard.

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Process of Using the ACP Wizard 8-5
Access ACP Wizard 8-6
Load ACP Settings 8-7
Set ACP Area 8-10
Set ACP Constraints 8-12
Set ACP Targets 8-16
Set ACP Parameters 8-19
Save ACP Settings 8-21
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View, Optimize and Apply ACP Results 8-26
View Capacity Report 8-30

Overview of Automatic Cell Planning

The Automatic Cell Planning (ACP) wizard provides an easy-to-use interface for entering parameters.

The main difference between the ACP wizard and advanced mode is that you can have only one optimization area, and the selected threshold configuration is used for all land use codes within the optimization area. If you want to use different threshold levels for different areas or land use codes, you must use advanced mode.

Site Parameters Optimized

Automatic cell planning optimizes the following site parameters:

- Pilot power coverage and quality
- Antenna azimuth
- Antenna mechanical tilt
- Electrical tilt (different antenna patterns for different tilt angles)

Fixed Parameter Values in ACP Wizard

The ACP wizard parameters that are assigned fixed values and not displayed in the windows include:

Parameter	Description	Wizard fixed value
Optimization areas	The geographical areas used to calculate penalties by the ACP.	Only one area
Number of preplanned areas	The geographical areas to keep constant as much as possible.	Only one area with lower priority than optimization area
Border sites	The sites considered in optimization but are not allowed to change. Coverage and interference from these sites is calculated and considered.	Small border Neighbors of the optimization sites and all other sites within the pathloss prediction radius from at least one optimization site
Minimum antenna separation	Minimum allowed angle between main lobes of different antennas on the same site.	30°
RSCP threshold interval	The minimum by which the threshold must be exceeded to give full penalty with linear increases in the interval.	0.0 (when threshold is exceeded, full penalty is applied)

Parameter	Description	Wizard fixed value
Ec/Io threshold interval	The minimum by which the threshold must be exceeded to give full penalty with linear increases in the interval.	0.0
Cost to penalty scale factor	Sector constraints cost values are multiplied by this factor before being compared with other penalty values.	Computed when Cost is optimization target
Max preplanned area degradation	The maximum penalty decrease acceptable for preplanned areas.	5%
Create plot snapshots	Creates plot snapshots of RSCP and Ec/Io plots before and after ACP.	Yes
SHO DL reduction factor	ASE downlink capacity reduction factor due to soft handover.	1.0 (No capacity is lost.)
SHO UL reduction factor	ASE uplink capacity reduction factor due to soft handover.	1.0 (No capacity is lost.)
Land use codes	Codes within the optimization area for which threshold parameters are used.	All land use codes
Terminal	Used for plot generation in WCDMA analysis.	ACP creates its own terminal

Automatic Measurement Integration (AMI)

You can include AMI measurement data in automatic cell planning. Measurement weights are rounded to the nearest available value according to the predefined selection. Detailed information for using Automatic Measurement Integration (AMI) and Automatic Sector Model Tuning (ASMT) are provided in the *TEMS CellPlanner Common Features User's Guide*.

You define the path to the measurement database in the **User settings** window, described in *TEMS CellPlanner Common Features User's Guide*.

Planning Before Using ACP Wizard

Automatic cell planning is performed in stages, described in the following table:

Phase	Description
1.	Determine a strategy for selecting areas to optimize. Decide whether to include a preplanned area. The ACP wizard allows only one optimization area and the thresholds apply to all land use codes.
2.	Determine the sites to optimize. The ACP wizard uses **Small border** for the border sites setting. See Set Border Sites Parameters, 9-10 for more information.
3.	Set the constraints groups based on possible configurations for sites and cells. It may be easier to use Excel and import the information into the ACP wizard.

Phase	Description
4.	Set optimization targets, thresholds, and penalty weights. The ACP wizard applies the same penalties and weights to all land use codes.
5.	Decide if you want to use automatic measurement integration. Determine if measured bins have more weight than predicted data.

Planning Guidelines

The following planning considerations are input to automatic cell planning:

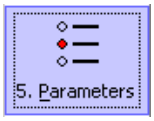
- Network performance targets
- Thresholds for coverage, quality and capacity, such as:

Threshold	Target
–75 dBm	Pilot coverage
-12 dB	Pilot quality
500 simultaneous supported users	Defined number of sites.

- Possible network changes and parameter values for each sector. For example, sector A on site 145 can have an azimuth between only 10 and 65 degrees.
- The cost of network changes. A high cost change must yield better network performance than a low cost change.
- The priorities of coverage, quality and capacity network performance parameters.
- The characteristics for an area, including the network performance targets and the priorities of the network performance parameters.

Process of Using the ACP Wizard

The stages of using the ACP wizard are described in the following overview:

Stage	Description
	If ACP settings are saved in a file from a previous session, load those settings.
	Select the area to use for optimization.
	Determine the sites for optimization and define constraints for possible cell configurations.
	Define optimization targets and set thresholds and priorities for the respective targets.
	Define the basic parameters to use in cell planning.
	Save settings in a file to use in future ACP sessions.
	Run ACP and view optimization progress.
	View and apply the proposed changes, optimize the order of changes, and save the results as a rollout plan.
	View the capacity with and without the proposed changes.

Access ACP Wizard

You can use ACP without running any previous analysis functions such as pathloss prediction or WCDMA analysis. The ACP will reuse existing pathloss prediction results if they match the ACP calculations.

Prerequisites

The sites and cells to use with ACP must all use the same carrier.

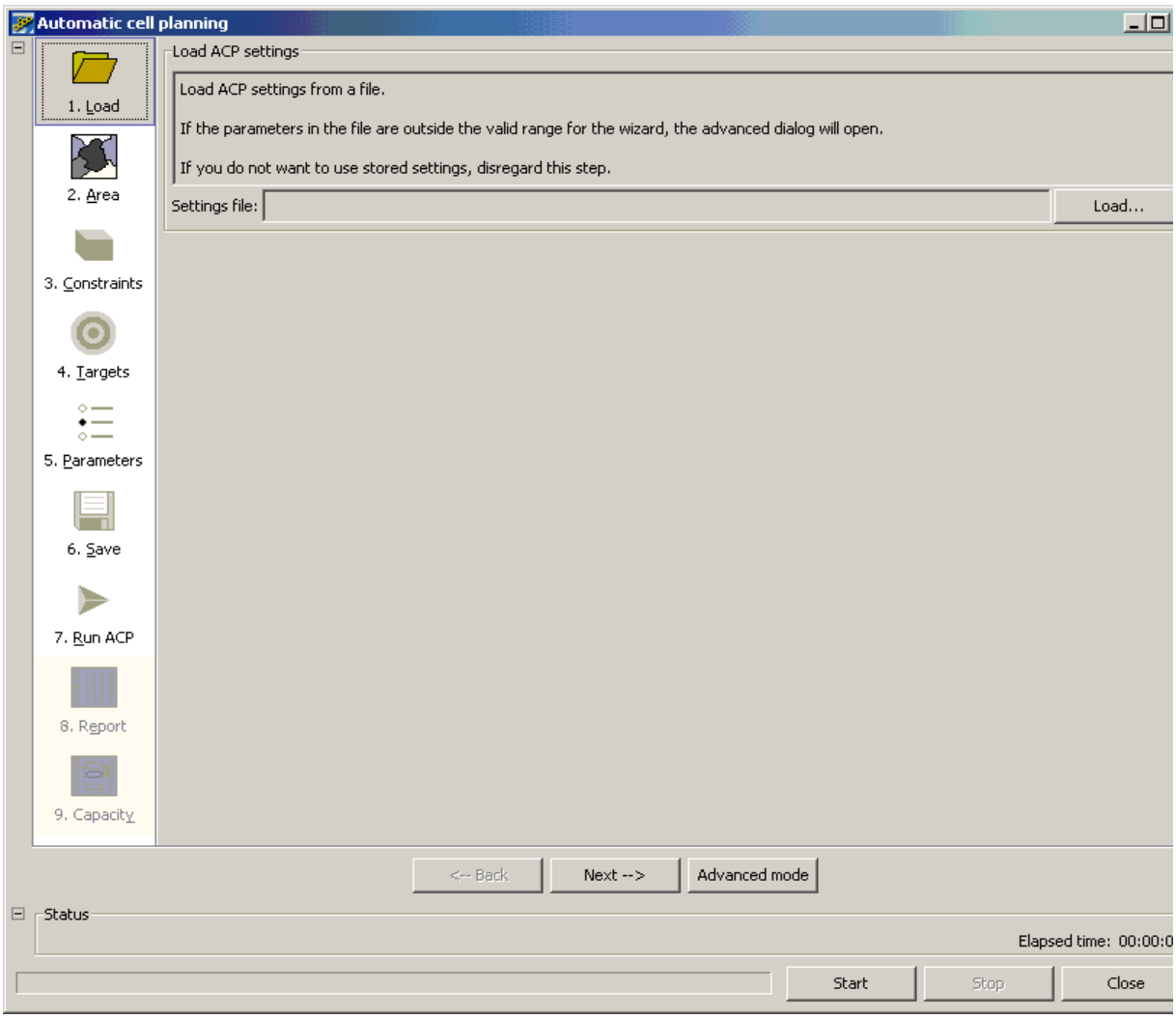
Procedure

Follow these steps to access the ACP wizard:

1. Select Analysis↗WCDMA↗Automatic cell planning. The wizard is displayed with the Load window highlighted.
2. Follow the online instructions to work through each window as required.

Load ACP Settings

Use this window to load parameters saved from a previous ACP session:



Fields on the Window

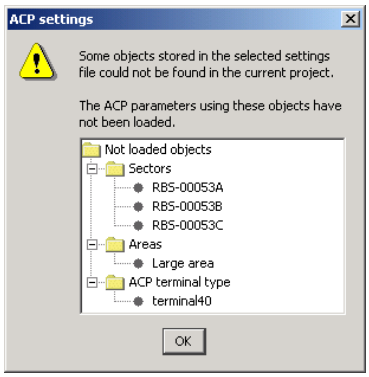
The following table describes the fields on the window:

Field	Description
Load	Loads automatic cell planning parameters from a file.

Field	Description
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

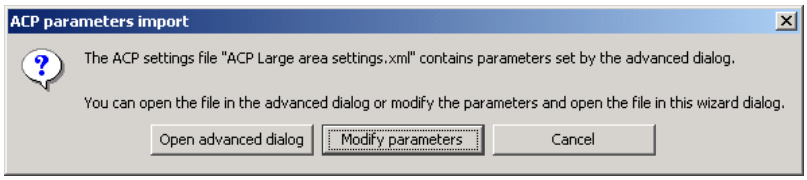
Objects Not Loaded

If objects referred to in the ACP parameters file are not found in the current project, the object names are displayed in a message window. All found parameters are loaded.



ACP Settings Import

If you select an ACP settings file created when using advanced mode, the file may contain parameters that do not conform to those of the wizard. When non-conforming parameters are found, a message is displayed so you can choose how to proceed:



The advanced parameter options include:

Option	Description
Open advanced dialog	Displays a window including parameters from the file.
Modify parameters	Adjusts parameters in the file and opens the file.
Cancel	Cancels the operation. The parameters are not loaded.

Settings for ACP Wizard and Advanced Mode

When you open a file that contains a non-conforming parameter, you can either open the settings file in advanced mode, or modify the parameters and load the settings in the ACP wizard. The wizard makes the following modifications:

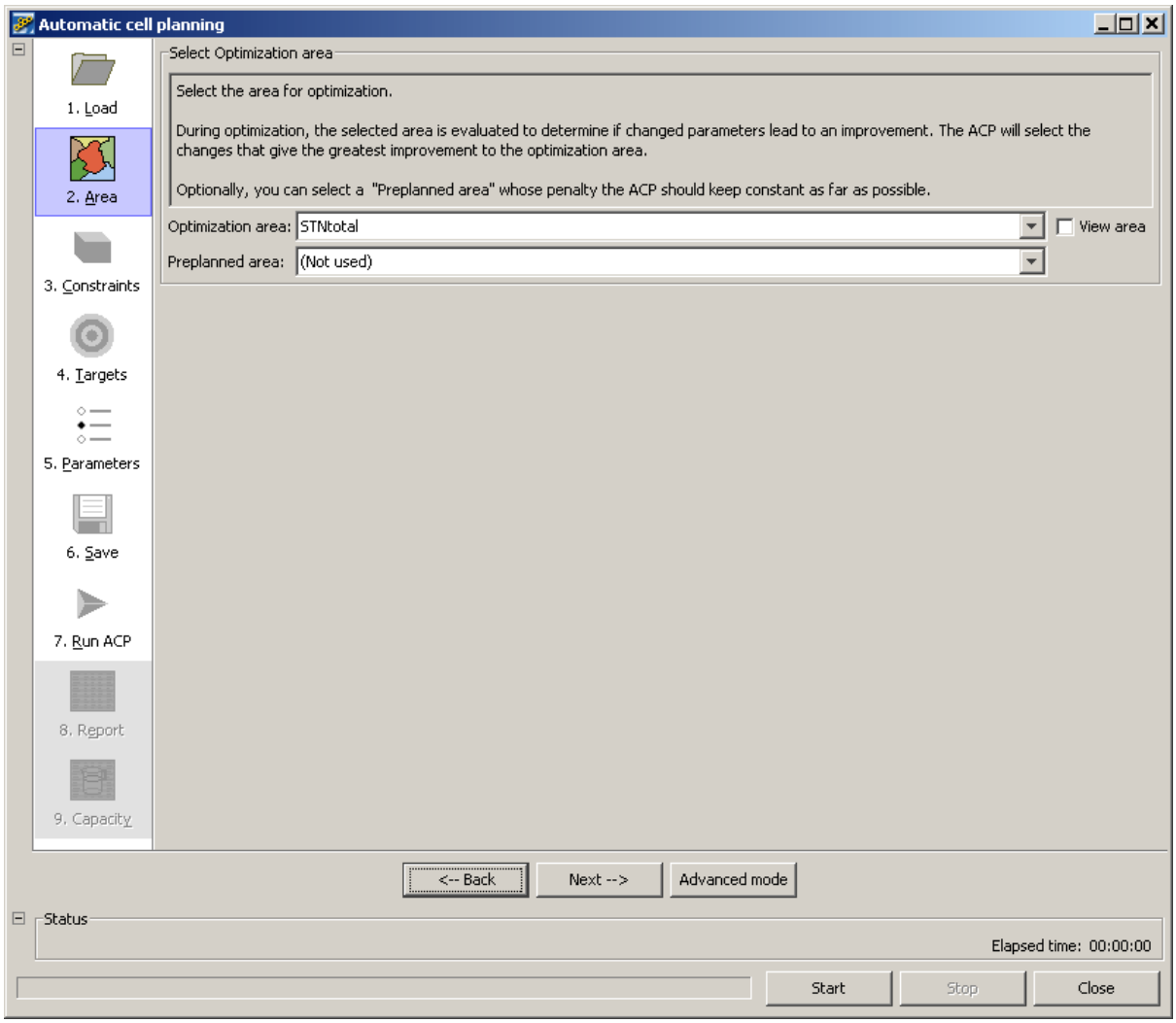
- All parameters with a fixed value in the ACP wizard are set to that value.
- When more than one optimization area exists in the ACP settings file, the one with lowest priority is selected. In the ACP wizard, area parameter mapping is between an area, a threshold definition, and a selection of land use codes.
- When more than one preplanned area exists in the ACP settings file, the one with lowest priority is selected.
- When more the one threshold group exists in the ACP settings file, the first group is selected. The parameters of the group are modified and selected in the Target window:.

Target	Modification by ACP Wizard
Threshold values	Rounded to the nearest available value according to predefined options.
Penalty weights	Rounded to the nearest available value according to predefined options. If a penalty weight in the threshold group equals 0.0, the corresponding parameter (RSCP or Ec/Io) is not a target for calculations. If the capacity penalty weight equals 0.0, the Capacity is not a target for the ACP. A penalty weight over 0.0 is rounded to the nearest available value according to predefined choices.
Threshold intervals	Set to the fixed value.

- If the cost to penalty scale factor is set to be computed automatically, this is interpreted as Cost being a target for the ACP. If the scale factor is not set to be computed automatically, Cost is not a target. The actual value stored for the scale factor is not considered.

Set ACP Area

Use this window to define the ACP area:



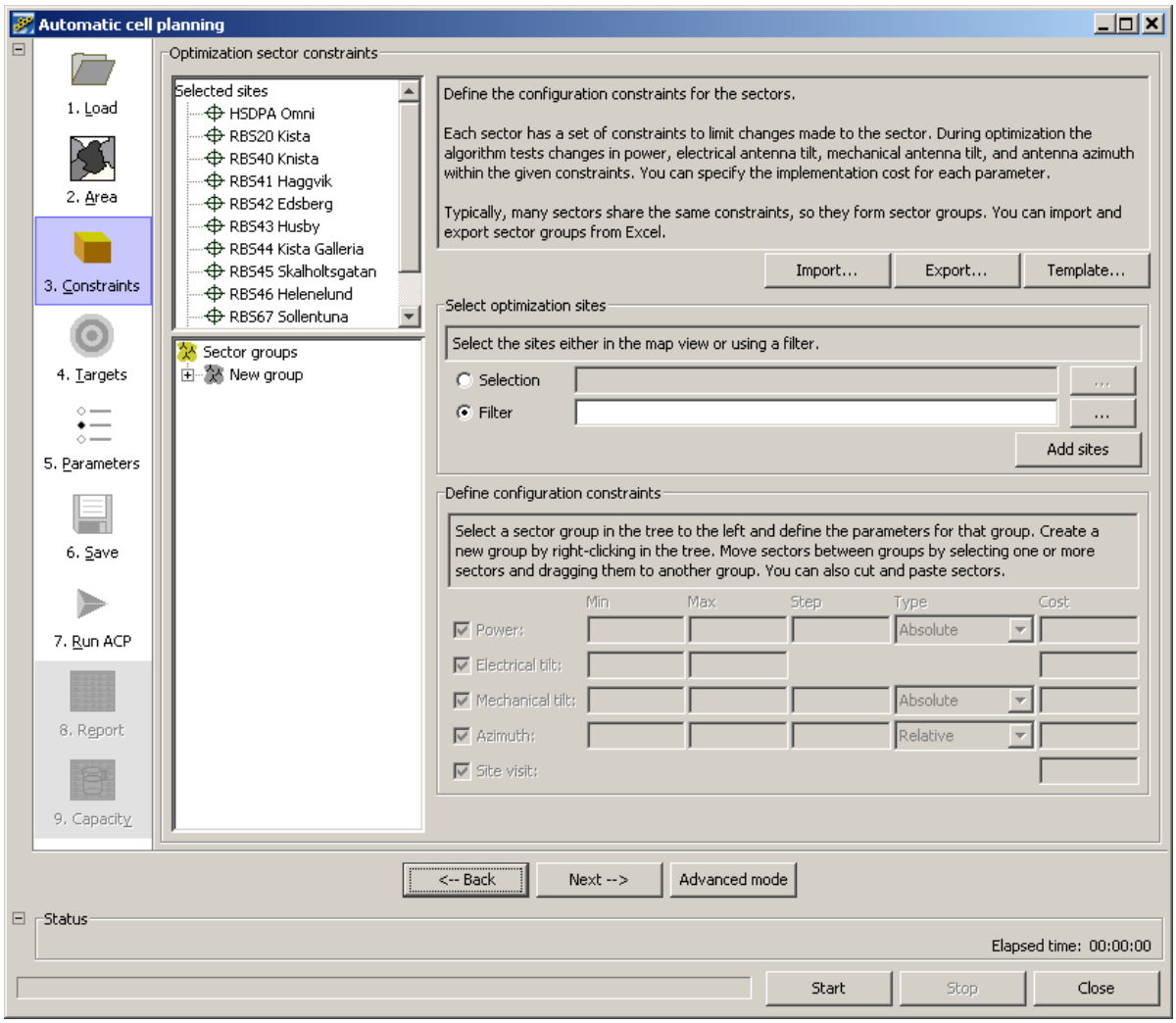
Fields on the Window

The following table describes the fields on the window:

Field	Description
Optimization area	The geographical area to optimize with the ACP. If no predefined areas exist in the current project, this field is displayed with a red background.
Preplanned area	A geographical area to maintain as a constant, with a maximum degradation of 5% allowed. By selecting Advanced mode you can change the setting. When the preplanned and optimization areas overlap, the optimization area has priority.
View area	Displays the area to optimize in the map display window.
Back	Moves to the previous window
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

Set ACP Constraints

Use this window to define optimization sites and to set constraints:



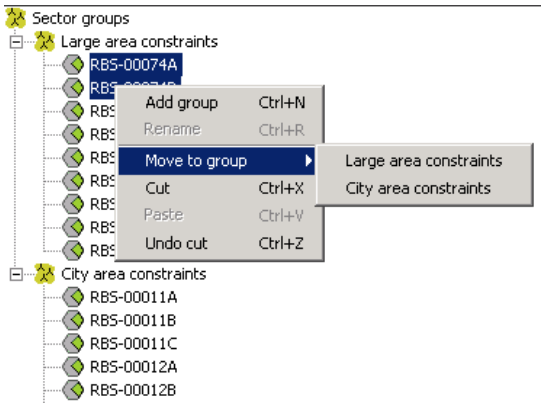
Fields on the Window

The following table describes the fields on the window:

Field	Description
Selected sites	Displays all sites selected for optimization.
Import	Imports optimization sectors and constraints from Excel
Export	Exports optimization sectors and constraints to Excel
Template	Creates an Excel template for sector constraints.
Sector groups	Displays the optimization sectors organized into groups with equal configuration constraints. In the tree view, you can create constraints groups and move sectors between groups. Right-click the tree to display the popup menu.
Selection	Use the sites selected in the map view.
Filter	Use sites based on predefined filters.
Add sites	Add optimization sites based on selection or filter.
Define configuration constraints	A selection of sectors to share configuration constraints. The name must be unique. Constraints for antennas are: • Power - Value relative to the current power setting, or an absolute. • Electrical tilt - Depends on the antenna lobes defined for the sector antenna type. • Mechanical tilt - Value relative to the current mechanical downtilt, or an absolute. • Azimuth - Value relative to the current antenna azimuth, or an absolute. • Site visit - Cost of physically visiting a site excluding the cost of actually changing something. For each group, you can define the following values. Invalid values are displayed with a red background color. • Min = Minimum value for the parameter • Max = Maximum value for the parameter • Step = Step interval used to change the value when testing the best configuration • Type = Type of parameter, relative to the existing value in the sector, or an absolute value. • Cost = Cost of changing the parameter.
Back	Moves to the previous window
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

Constraints Menu

Right-click in the tree to display the menu.



When you remove all sectors of a site, the site is removed from the **Selected sites** list. When you remove a site from the **Selected sites** list, all its sectors are removed from the sector groups.

Change Constraints Using ACP Wizard

Use this procedure to create or change sector constraints using the ACP wizard:

1. Add optimization sites.
2. Create constraints groups for sectors with equal physical constraints.
3. Distribute the optimization sectors to the corresponding constraints groups, and remove sectors that should not be changed.

Change Constraints Using Excel and ACP Wizard

Use this procedure to create and edit sector constraints in a spreadsheet application like Excel, and then import the Excel file:

1. Create an Excel template for the constraint information.
2. Edit the template using constraints information saved in other sources, such as an Excel spreadsheet.
3. Import the Excel file into the ACP wizard.

Excel Template Structure

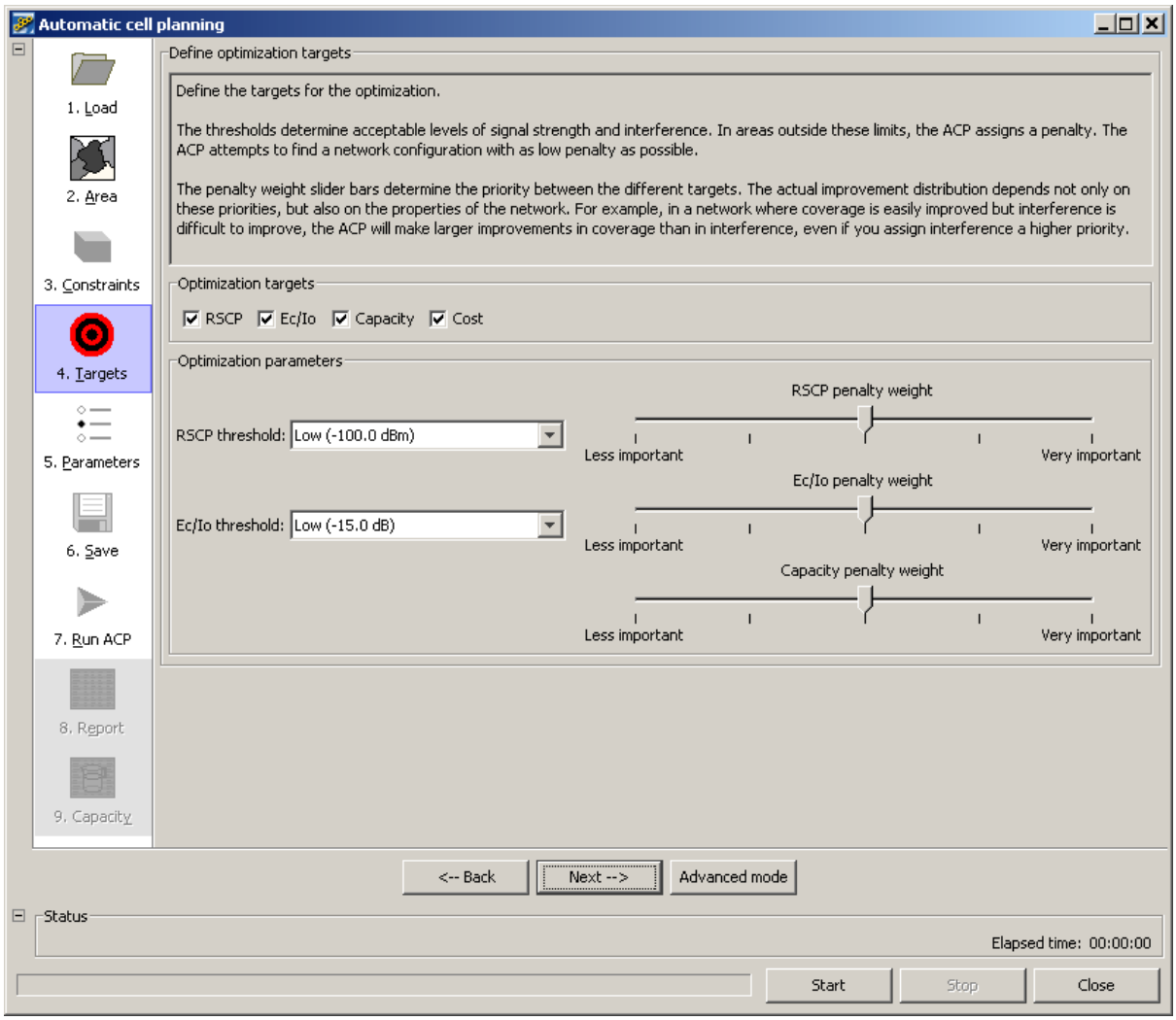
See "Structure of Sector Information for Import/Export, 9-26, for a description of the Excel template structure.

Problems during Import

See Troubleshooting Sector Information Import/Export, 9-29, for more information about possible problems occurring during the import.

Set ACP Targets

Use this window to set targets for automatic cell planning:



Fields on the Window

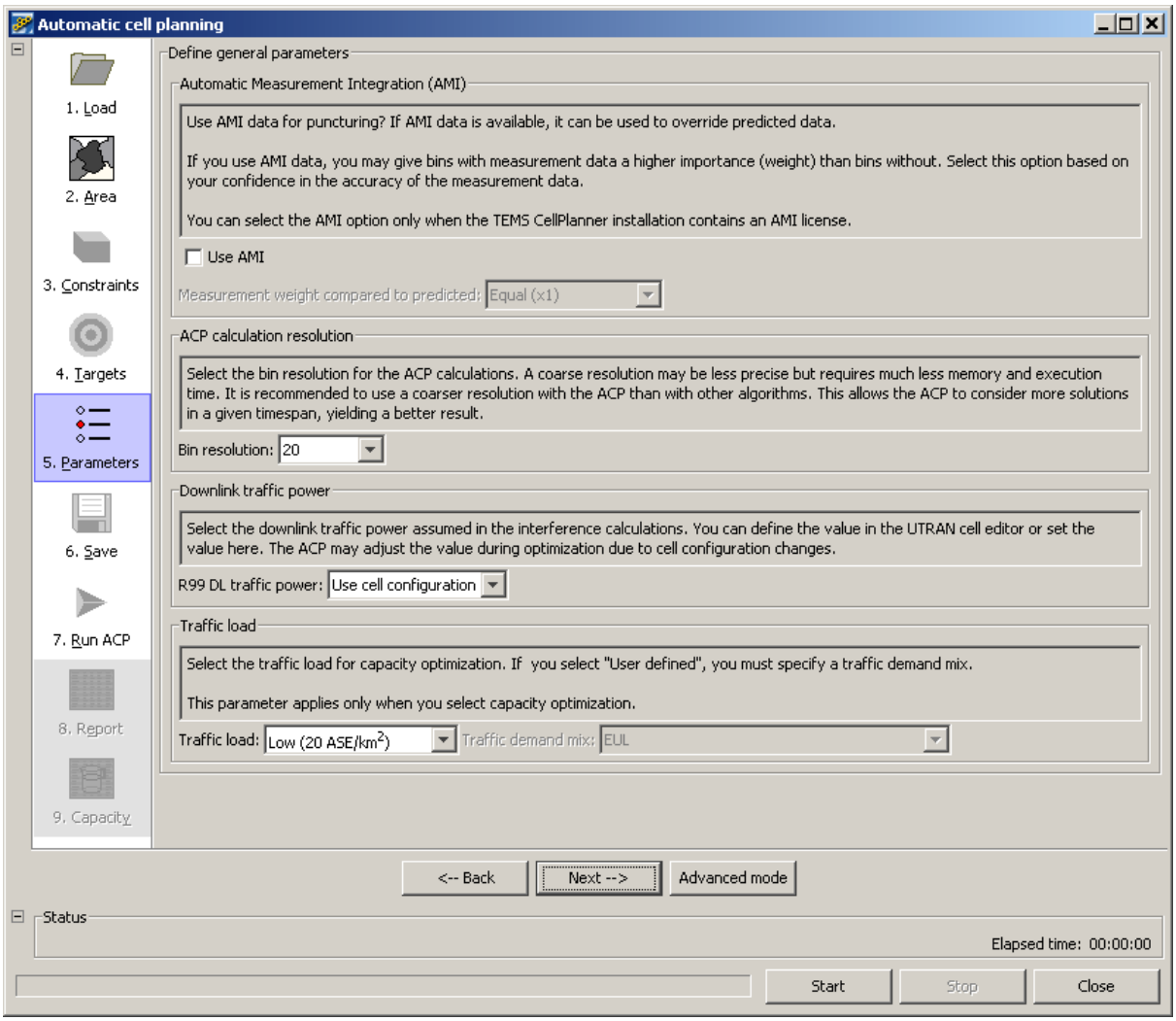
The following table describes the fields on the window:

Field	Description
Optimization targets	• RSCP (coverage) • Ec/Io (quality) • Capacity • Cost
RSCP threshold	The signal strength below which coverage penalties will be assigned. Options are: • -100.0 dBm • -80.0 dBm • -70.0 dBm
RSCP penalty weight	The relative priority for coverage compared to the other targets. The priority is translated into penalty scoring value for a bin that violates the threshold. Options are: • 1.0 (Less important) • 2.0 • 3.0 • 4.0 • 5.0 (Very important)
Ec/Io threshold	The Ec/Io below which quality penalties will be assigned. Options are: • -15.0 dB • -10.0 dB • -5.0 dB
Ec/Io penalty weight	The relative priority for quality compared to other targets. The priority is translated into penalty scoring value for a bin that violates the threshold. Options are: • 1.0 (Less important) • 2.0 • 3.0 • 4.0 • 5.0 (Very important)
Capacity penalty weight	The relative priority for capacity compared to the other targets. The priority is translated into penalty scoring value for a bin that violates the threshold. • 1.0 (Less important) • 2.0 • 3.0 • 4.0 • 5.0 (Very important)
Back	Moves to the previous window

Field	Description
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

Set ACP Parameters

Use this window to set general parameters for automatic cell planning:



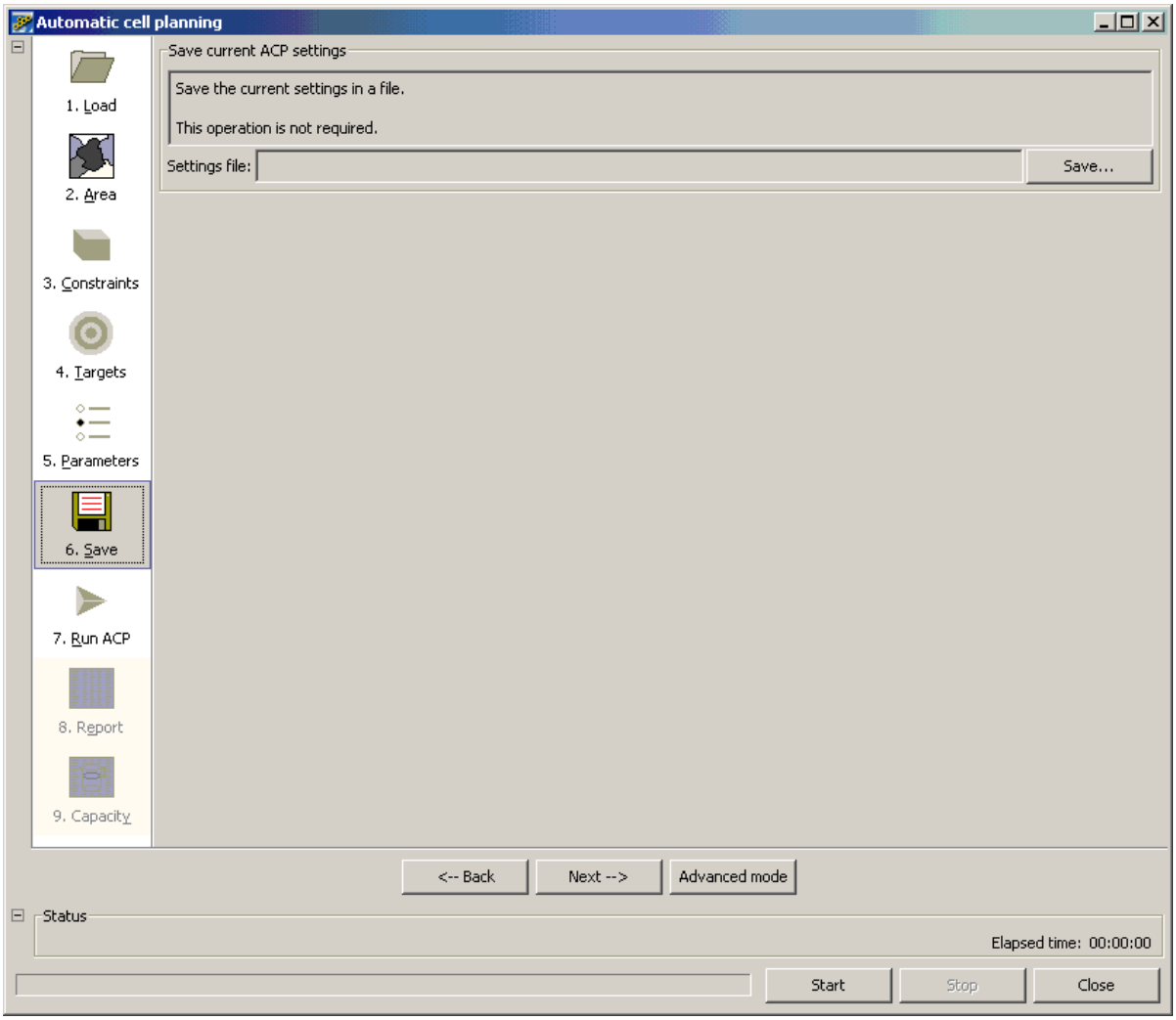
Fields on the Window

The following table describes the fields on the window:

Field	Description
Use AMI	Uses automatic measurement integration (AMI) data. If using AMI, indicates if measured bins should have higher weighting than predicted data. Options are: • Equal (x1) • High (x3) • Very high (x9)
Bin resolution	ACP pathloss resolution used during calculations. The larger the resolution, the faster the calculation. A more detailed resolution causes the calculations to take longer. It is recommended to use a coarser resolution with the ACP to allow the software to evaluate more solutions in a given time span, yielding a better result.
R99 DL traffic power	The power used by ACP analysis for the cells. In advanced mode this parameter is *always* obtained from the cell configuration. • Use cell configuration - uses power from cell configuration • Low (27 dBm) • Medium (32 dBm) • High (37dBm)
Traffic load	The traffic load used for capacity calculations when capacity is a target. Traffic load can be defined only when you select Capacity as a target for optimization. In advanced mode this parameter is *always* extracted from the selected traffic demand mix. • Low (20 ASE/km$^{2)}$ • Medium (100 ASE/km2) • High (500 ASE/km2) • User defined
Traffic demand mix	When you select **User defined** traffic load, the traffic load is retrieved from the selected traffic demand mix. If you select **User defined** and no traffic demand mix is defined, this field is displayed with a red background. You must define the traffic demand mix before selecting **User defined**.
Back	Moves to the previous window
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

Save ACP Settings

Use this window to save the automatic cell planning parameters to a file:



Use the **ACP Load** window to load saved settings.

Fields on the Window

The following table describes the fields on the window:

Field	Description
Settings file	Name of the file to save
Save	Saves the cell planning parameters in an XML-file with a version number.
Back	Moves to the previous window
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings.

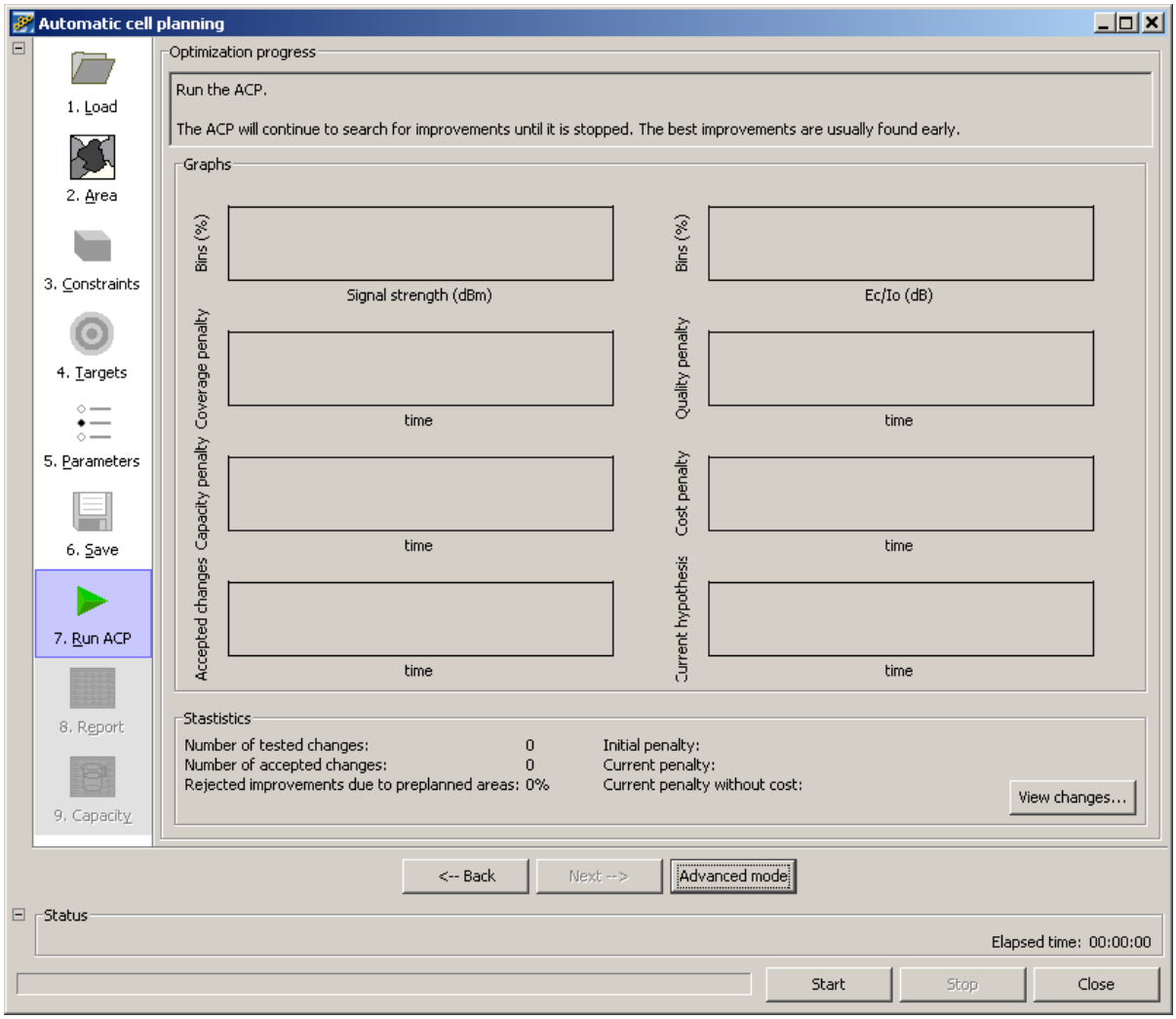
Procedure

Follow these steps to save automatic cell planning settings for later use:

1. Click Save. A window is displayed so you can select the directory for saving the automatic cell planning settings.
2. Enter a file name, and click OK. The settings are saved in a file.

Run ACP and View Optimization Progress

Use this window to start ACP and view the progress of ACP optimization:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Bins (%) signal strength (dBm)	The number of bins with a certain cumulative signal strength (dBm). The black graph shows the original status and the red graph shows the current status.
Coverage penalty	The total coverage penalty calculated for the optimization area.
Capacity penalty	The total capacity penalty calculated for the optimization area.
Accepted changes	Accepted changes for optimization. These changes may differ from the rollout plan when you stop the ACP, because a cell may have an accepted change, but after continued processing, the cell is changed again.
Bins (%) Ec/Io (dB)	The number of bins with a certain cumulative quality (Ec/Io). The black graph shows the original status and the red graph shows the current status.
Quality penalty	The total quality penalty calculated for the optimization area.
Cost penalty	The total cost penalty calculated for the optimization area.
Current hypothesis	Shows the process working and trying solutions.
Number of tested changes	Number of changes tested.
Number of accepted changes	Number of accepted changes.
Rejected improvements due to preplanned areas	Changes rejected because of preplanned areas.
Initial penalty	The initial penalty when you started optimization.
Current penalty	The sum of all total penalties.
Current penalty without cost	The sum of all total penalties, excluding cost.
View changes	Displays details for the accepted changes in the ACP sector changes window, showing sector name, changed parameter, and old and new values.
Back	Moves to the previous window
Next	Moves to the next window
Advanced mode	Opens a new window so you can add or change parameters or settings. While the ACP process is running, this option is unavailable.

Procedure

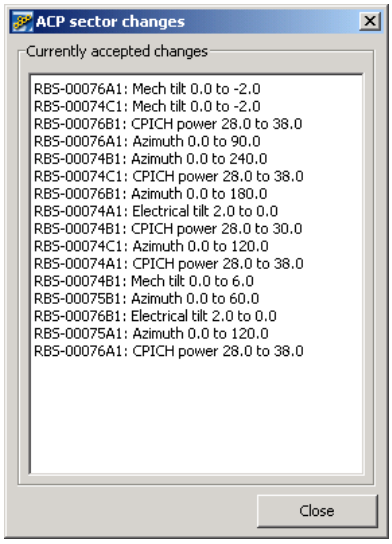
Follow these steps to start automatic cell planning:

1. Make entries in the fields as desired based on planning decisions.
2. Click **Start**. The **Optimization progress** window becomes active so you can watch the progress and determine when optimization is sufficient.

   The current penalties, distribution of signal strength, Ec/Io over analyzed bins, the number of changes and cumulative signal strength and quality are displayed. Place the mouse pointer on any graph to display current status.

View the Currently Accepted Changes

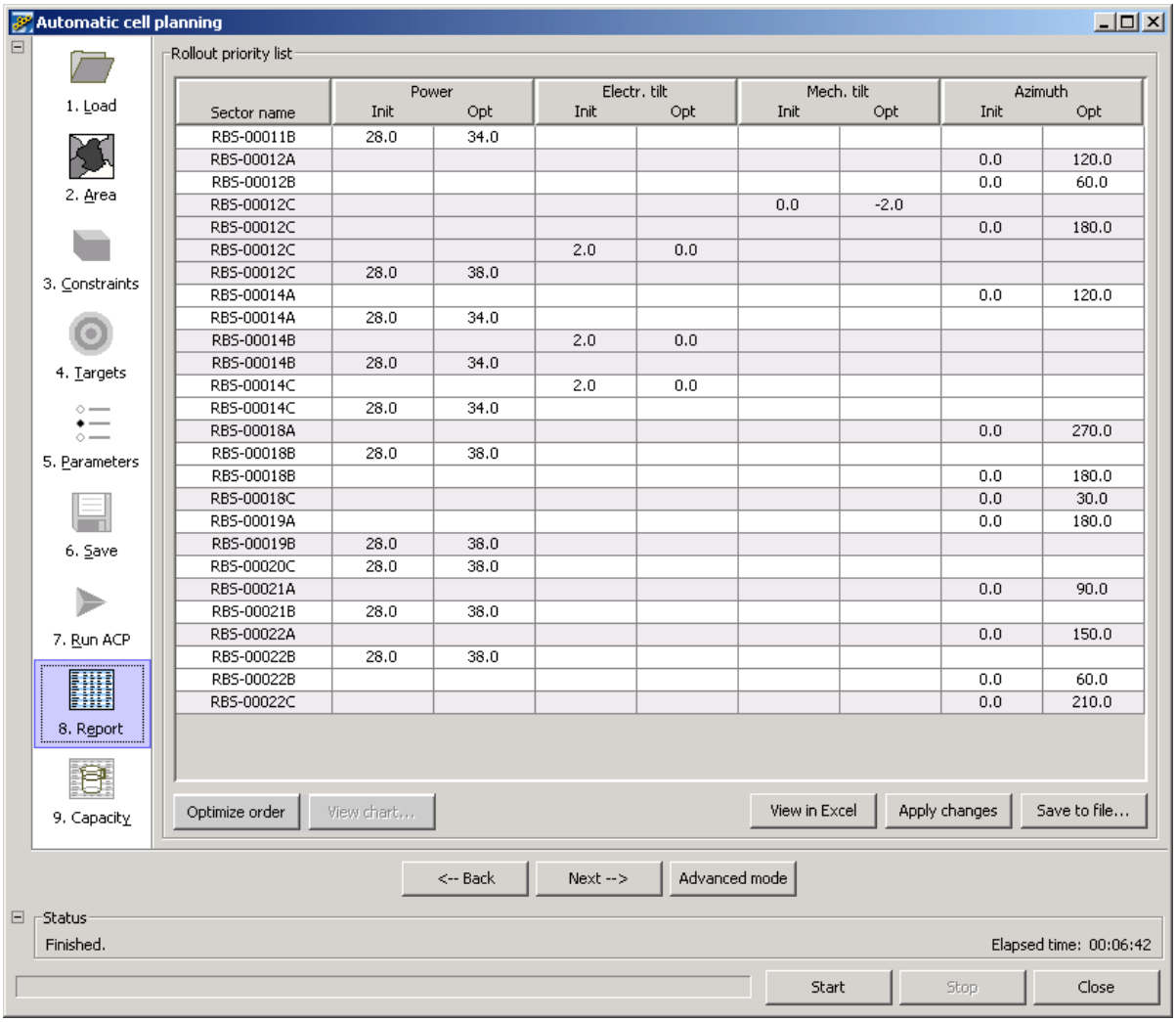
When you click **View changes**, the **ACP sector changes** window is displayed, showing the currently accepted changes from the optimization process:



View, Optimize and Apply ACP Results

Use this window to view and apply the proposed changes, optimize the order of changes, and save as a rollout plan.

The **Report** window becomes active when you stop the ACP, and displays sector changes found to give the lowest penalties. You can apply results to individual or all sectors:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Sector name	The name of the sector.
Power	• Init - Initial power value before processing • Opt - Optimized power value found after automatic cell planning
Electr. tilt	• Init - Initial electrical tilt value before processing • Opt - Optimized electrical tilt value found after automatic cell planning
Mech. tilt	• Init - Initial mechanical tilt value before processing • Opt - Optimized mechanical tilt value found after automatic cell planning
Azimuth	• Init - Initial azimuth before processing • Opt - Optimized azimuth value found after automatic cell planning
Optimize order	Starts the rollout plan optimizer. The optimizer searches for changes to give the greatest reduction in penalty, places it first in the list, and repeats the process for all remaining changes. The resulting list in the **Report** window shows the optimized order of changes.
View chart	Displays a histogram of the optimized order of changes. The change with the greatest penalty reduction is shown as the left bar on the x axis. By selecting a change in the **Report** window, the corresponding bar and the bars of all preceding changes are highlighted in the histogram. Placing the mouse pointer on any bar in the chart displays the penalty reduction of that change. This button is disabled until after you run **Optimize order**.
View in Excel	Allows you to use the report as a rollout plan. Displays the results in Excel spreadsheet format. If you select no items in the rollout priority list, all changes will be included. To apply a selection of changes, use multiple selection (Ctrl-click and Shift-click).
Apply changes	Applies the values from the rollout report to the project. If you do not exclude items in the rollout priority list, all changes will be included. To view a selection of changes, use multiple selection (Ctrl-click and Shift-click).
Save to file...	Saves the values from the rollout report to a text file. If you selected no items in the rollout priority list, all changes will be included. To save a selection of changes, use multiple selection (Ctrl-click and Shift-click). See *TEMS CellPlanner Common Features User's Guide,* chapter "Import Cells Text File", about importing the text file to the project.

Field	Description
Back	Moves to the previous window.
Advanced mode	Opens a new window so you can add or change parameters or settings. While the ACP process is running, this option is unavailable.

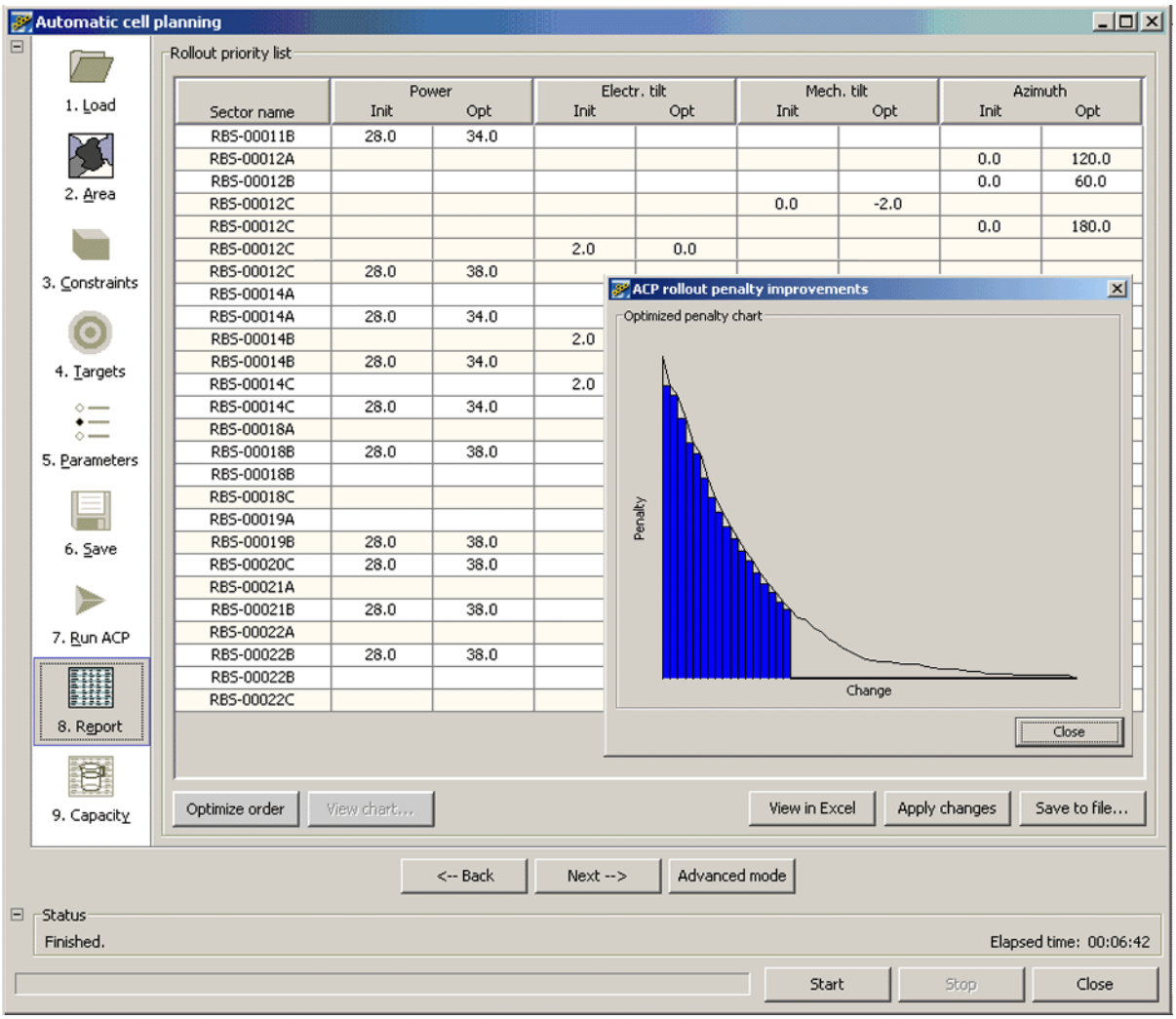
Procedure

Follow these steps to optimize the order of changes, to apply the results and to create a rollout plan in Excel:

1. To optimize the order of changes, click **Optimize order**. The **Rollout plan optimizer progress** window shows the progress. The optimization is based on all changes in the list, even if you select changes. You can interrupt the optimization by clicking **Cancel**.
2. To view a histogram of the penalty reductions with the optimized order of changes, click **View chart**. The **ACP rollout penalty improvements** window is displayed. See Example ACP rollout penalty improvements histogram, 8-29.
3. To use the automatic cell planning as a rollout report, click **View in Excel**.
4. To apply changes to the project, click **Apply changes**.
5. To save the rollout report to a text file for importing at a later time, **click Save to file...**

Example ACP rollout penalty improvements histogram

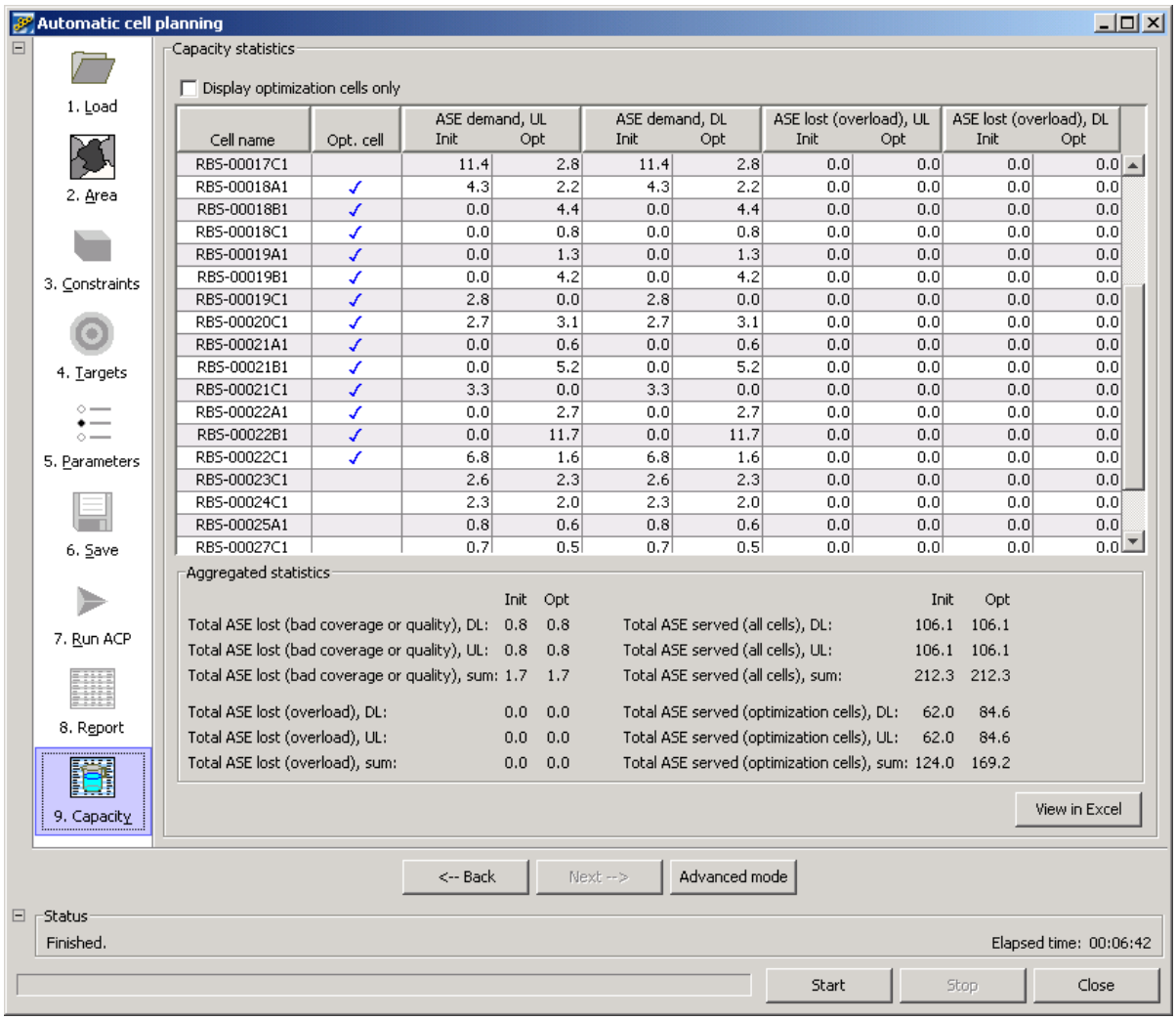
The following example shows a **ACP rollout penalty improvements** histogram:



The bars show the penalty reduction per change. The histogram displays the first change in the list up to and including the last selected change. Example: If changes 3 and 5 are selected, the histogram will display the bars of changes 1 to 5.

View Capacity Report

Use this window to view the capacity as a result of the proposed changes.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Display optimization cells only	Displays only the optimization cells. If not selected, the border cells are also displayed.
Cell name	The name of the cell.
Opt cell	Checked when the cell is an optimization cell.

Field	Description
ASE demand	Displays the ASE demand per cell, for UL and DL. • Init - Number of ASE before ACP optimization • Opt - Number of ASE after ACP optimization The ASE demand is the number of simultaneous users per square kilometer, expressed in ASE.
ASE lost (overload)	Displays the number of lost ASE per cell due to overload, for UL and DL. • Init - Number of lost ASE before ACP optimization • Opt - Number of lost ASE after ACP optimization
Aggregated statistics	Displays statistics for UL, DL, and UL and DL: • Total ASE lost (due to bad coverage or quality) • Total ASE lost (due to overload) • Total ASE served (all cells) • Total ASE served (optimization cells)
View in Excel	Displays capacity statistics in Excel spreadsheet format. If you select no cells, all cells are included. To view a selection of cells, use multiple selection (Ctrl-click and Shift-click).
Back	Moves to the previous window
Advanced mode	Opens a new window so you can add or change parameters or settings. While the ACP process is running, this option is unavailable.

Procedure

To view the capacity report in Excel format, click View in Excel. The optimization cells are marked with an asterisk (*).

9
Using Advanced Automatic Cell Planning

This chapter describes how to use the advanced mode of automatic cell planning.

Topics **Page**

Overview of Automatic Cell Planning 9-2
Load Automatic Cell Planning Parameters 9-4
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Set Border Sites Parameters 9-10
Set Threshold Parameters 9-12
Set Area Parameters 9-15
Save Automatic Cell Planning Parameters 9-19
View Optimization Progress of Automatic Cell Planning 9-21
View, Optimize and Apply Automatic Cell Planning Results 9-23
View Capacity after Automatic Cell Planning 9-25
Structure of Sector Information for Import/Export 9-26
Troubleshooting Sector Information Import/Export 9-29

Overview of Automatic Cell Planning

Automatic cell planning (ACP) assists manual design and optimization for the radio part of a mobile network. ACP optimizes the following network data:

- Site information (location, antenna configuration, power, and so forth)
- Pathloss
- Traffic
- Map data (elevation and land use data)

Planning Guidelines

Use the following guidelines for planning a network:

- Network performance targets
  - Thresholds for coverage, quality and capacity such as –75 dBm for pilot coverage, -12 dB for pilot quality, and 500 simultaneous supported users for a defined number of sites.
- Possible network changes
  - The possible network changes with possible parameter values for each sector. For example, sector A on site 145 can have only an azimuth between 10 and 65 degrees.
- The cost of network changes
  - A high cost change must yield better network performance than low cost changes.
- The priority between network performance parameters of coverage, quality and capacity
- The characteristics for an area, including the network performance targets and the priority between the network performance parameters.

Using these planning guidelines can help you to define the input data to the ACP, allowing the application to find the correct solution.

Prerequisites

The sites and cells to use with ACP must all have the same carrier.

Polygons and Land Use in Optimization

The optimization performed by the ACP uses threshold mapping with polygons and land use categories.

Results of Automatic Cell Planning

During automatic cell planning you can view graphically the optimization progress with time on the x-axis and the network score on the y-axis.

Automatic cell planning produces a rollout plan for recommended changes in Excel spreadsheet format.

You can apply the results to the current project directly or save the results in a cell text file for later import.

After performing automatic cell planning, you can compare result plots and generate a delta plot based on two plots.

Process of Automatic Cell Planning

Automatic cell planning should be done in several stages or phases:

1. Determine the strategy for selecting areas to optimize. Decide if you want to use different thresholds for different land use codes. Decide whether a preplanned area should be included.
2. Determine the sites to optimize. Determine the sites to use as border sites. If you use a large number of border sites, this may affect the automatic cell planning processing time.
3. Set up the constraints groups based on possible configurations for the sites and cells. You may find it easier to use Excel and import the information to automatic cell planning.
4. Set the thresholds. You may want to have different thresholds in different areas to use with different land use codes.
5. Select the areas to optimize and apply the corresponding thresholds values for those areas and land use codes. Make sure that the priority of the areas is correct.
6. Decide if you want to use automatic measurement integration. Determine if measured bins should have higher weighting than predicted data. Ensure that the weighting is not set too high.

Post-Processing Results

The results from automatic cell planning are a number of proposed changes to reduce the penalty during rollout, displayed in alphabetical order. You can post-process the results:

1. Optimize the order of changes.
2. Check that the obtained capacity is adequate.

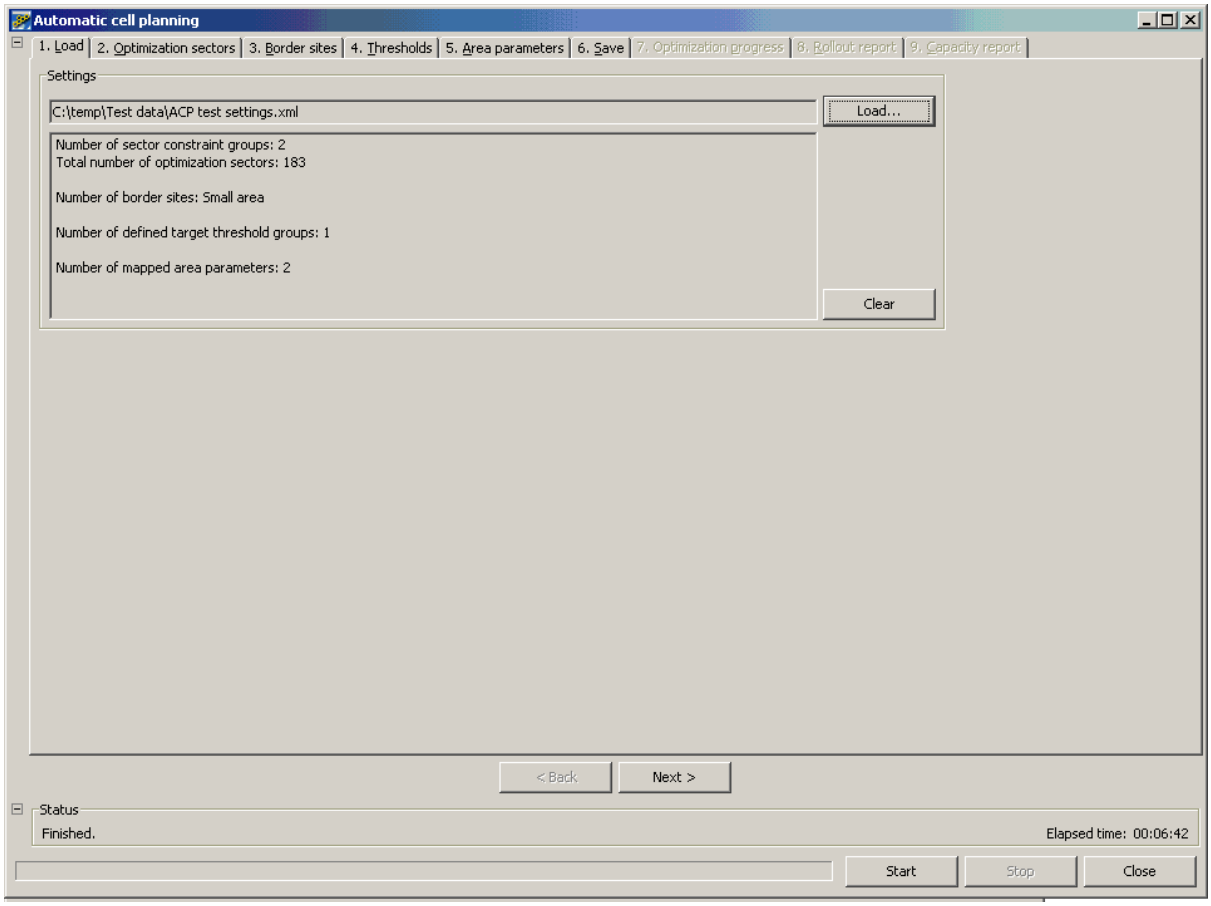
Load Automatic Cell Planning Parameters

Use this procedure to load parameters saved from a previous planning session to use for automatic cell planning.

The parameters are saved in an XML-file with a version number.

Window to Use

Use the Automatic cell planning - Load window to set basic cell planning options:



Fields on the Window

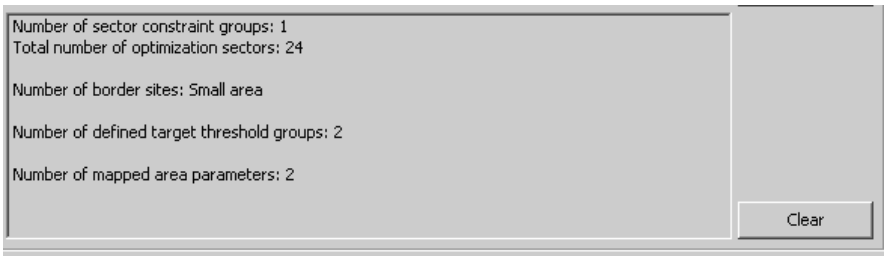
The following table describes the fields on the window:

Field	Description
Load	Loads automatic cell planning parameters from a file.
Clear	Clears the loaded settings.
Next	Moves to the next window

Procedure

Follow these steps to load ACP parameters saved from a previous work session:

1. Select **Analysis↗WCDMA↗Automatic cell planning**. The **Load** window is displayed.
2. Navigate to the directory where the automatic cell planning parameter settings are stored and click **Load**. Information about the settings in the file is displayed, as shown in the example:



   This information includes the number of constraint groups, the total optimization sectors, number of border sites based on area selection, number of defined target threshold groups, and the number of mapped area parameters.
3. To clear the loaded settings in all windows, click **Clear**.

Set Optimization Sector Parameters

Use this procedure to set optimization sector parameters for automatic cell planning, including the sectors to optimize, and the optimization parameter constraints.

Creating Sector Constraints Groups

When importing the sector constraints, group sectors with identical constraints.

Controlling Sector Assignment

A specific sector can belong to only one sector constraints group. During import the sectors imported cannot be part of existing sector constraints groups. When such sectors are found, they are removed from the existing group.

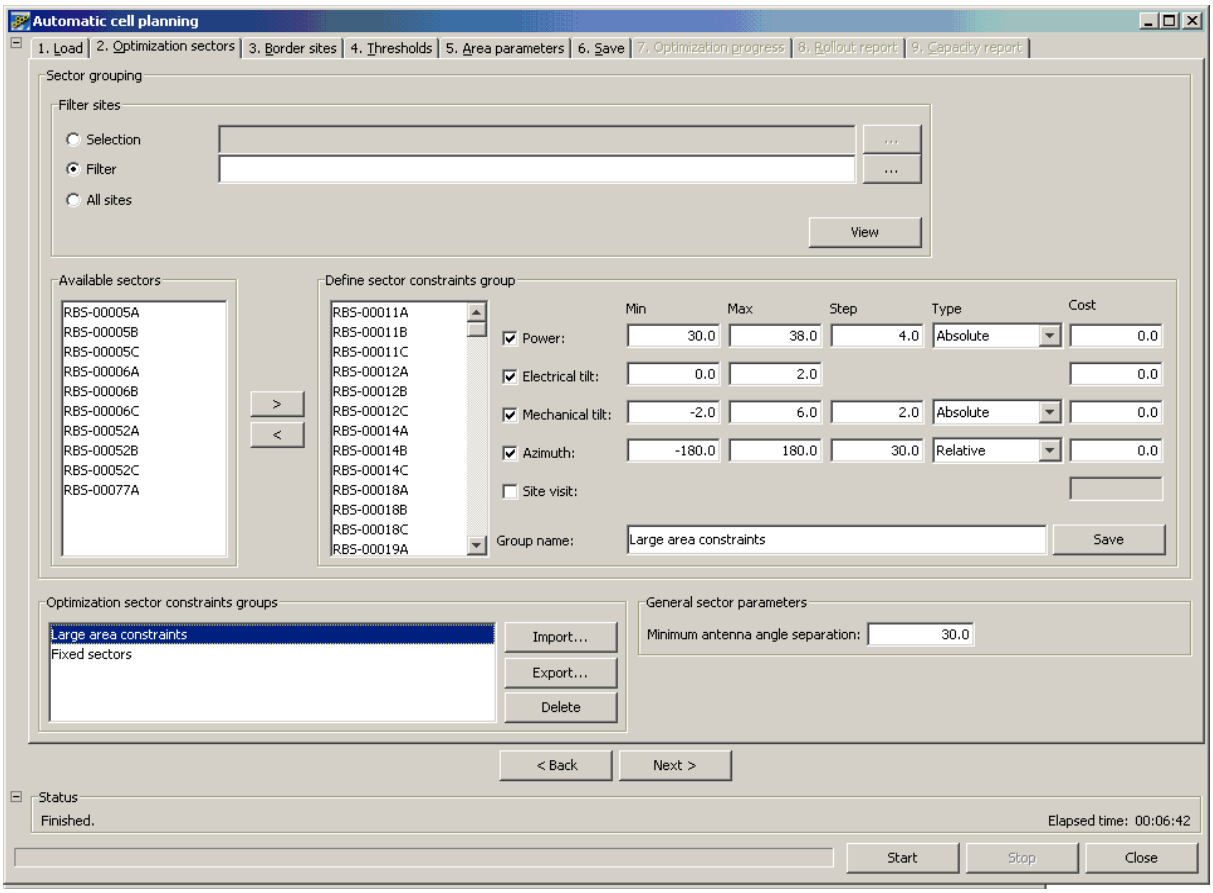
The list of available sectors contains only unassigned sectors.

Site with Optimization Sectors

A site with optimization sectors cannot be a border site at the same time.

Window to Use

Use the **Automatic cell planning - Optimization sectors** window to enter optimization sectors for automatic cell planning:



Fields on the Window

The following table describes the fields on the window:

Field	Description
All sites	Displays all sectors from all sites in the area.
View	Displays the available sectors from the selected sites.
Available sectors	The available sectors from the selected sites are displayed when you click **View**.

Field	Description
Sector constraints group	A selection of sectors to share configuration constraints. The name must be unique. Constraints for antennas are: • Power - Relative the current power setting, or an absolute value. • Electrical tilt - The electrical tilt used by the ACP depends on the antenna lobes defined for the sector antenna type. • Mechanical tilt - Relative to the current mechanical downtilt, or an absolute value. • Azimuth - Relative to the current antenna azimuth, or an absolute value. • Site visit - Relative cost of physically visiting a site excluding the cost of actually changing something. For each group, you can define the following values. Invalid values are displayed with a red background color. • Min = Minimum value that can be assigned to the parameter • Max = Maximum value that can be assigned to the parameter • Step = Step interval that the ACP calculations can use to change the value when testing the best configuration • Type = Type of parameter, relative to the existing value in the sector, or an absolute value. • Cost - Relative cost of changing the parameter.
Group name	A name of the sector constraints group
Save	Saves the sector constraints group
Optimization sector constraints groups	Lists the defined sector constraints groups. There may be some cells where only electrical downtilt is possible and others where only azimuth changes are possible. So you can add a number of constraints groups to handle each of these conditions. A sector may only be part of one constraints group. Sectors that are part of a group are excluded from the available sectors list.
Import	If you make a number of different settings in different cells, then several constraints groups are created when importing. See Structure of Sector Information for Import/ Export, 9-26.

Field	Description
Export	Exports constraints groups to Excel so you can make changes using Excel. You can define the minimum and maximum values, step sizes, intervals, and so forth, exactly as if you were using the automatic cell planning. If you leave a field empty, the system inserts zeros. If no group is selected, only the header row will be created in the Excel sheet.
Delete	Deletes a defined sector constraint group or groups.
Minimum antenna angle separation	Defines the minimum angle between the main lobes of different antennas on the same site.
Back	Moves to the previous window
Next	Moves to the next window

Procedure

Follow these steps to define sector constraint groups:

1. Define sector constraints groups by entering the minimum and maximum values, the step size, and type of constraint.
2. When you complete the definition of a sector constraints group, enter a name for the group and click Save. The sector constraints group is now listed in the Optimization sector constraints group box.
3. Continue to add sector constraints groups as required.

Set Border Sites Parameters

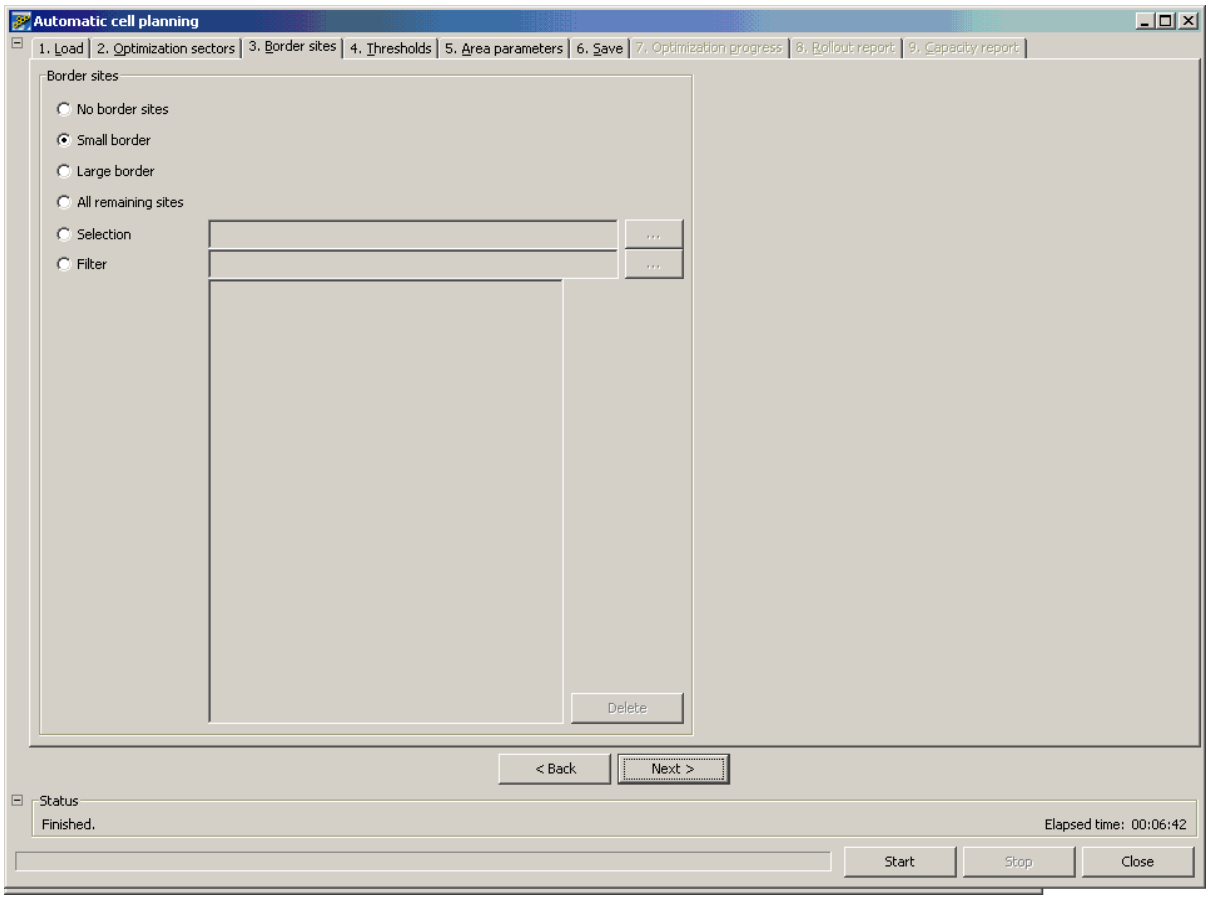
Use this procedure to set border site parameters for automatic cell planning.

The border sites are considered in optimization but changes are not allowed to the sites. The coverage and interference from these sites is calculated and considered.

If you include many sites as border sites, this consumes a great deal of computer resources as the border sites are included in CPLM calculations.

Window to Use

Use the Automatic cell planning - Border sites window to set border site options:



Fields on the Window

The following table describes the fields on the window:

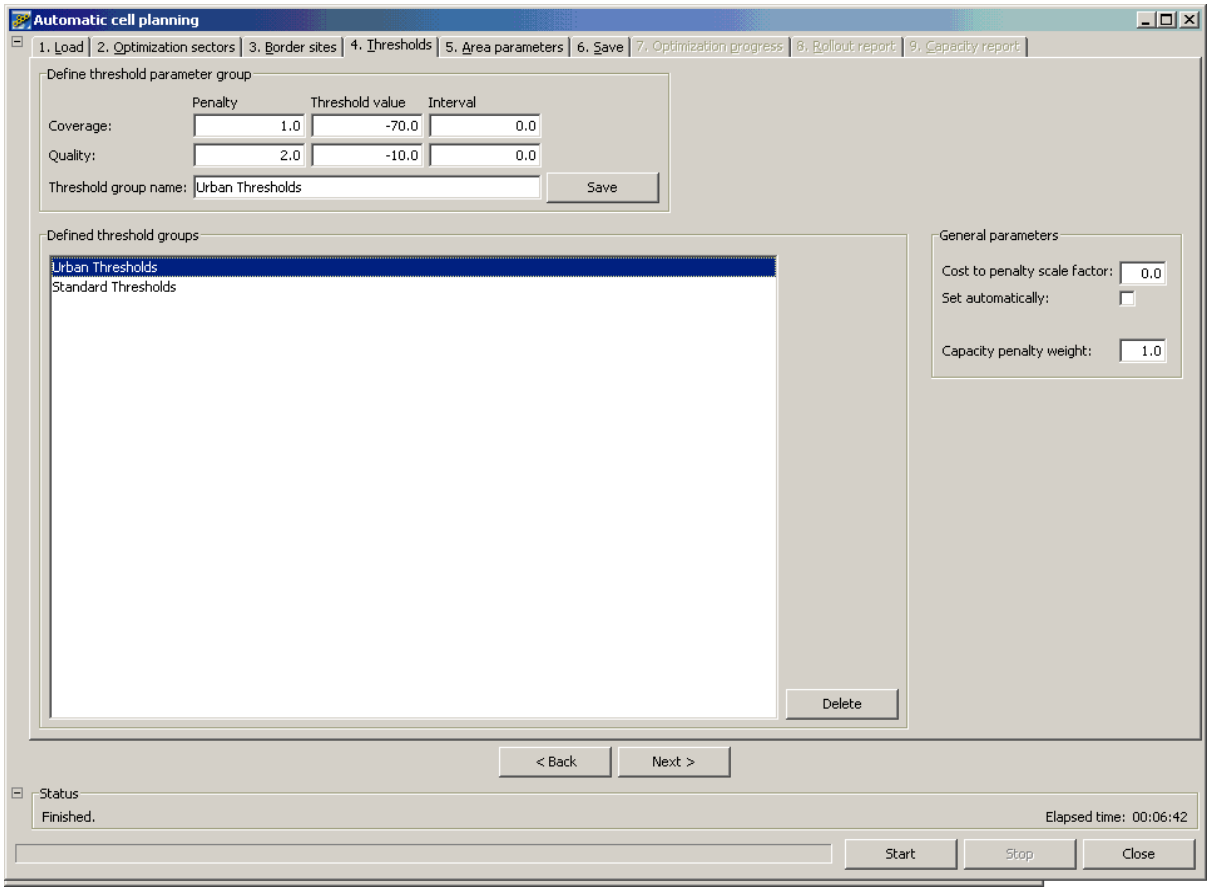
Field	Description
No border sites	No border sites are considered in the ACP.
Small border	The sites located within the pathloss prediction radius of at least one of the optimization cells are considered in the ACP.
Large border	Small border sites and their neighbor cells are considered in the ACP.
All remaining sites	All sites are considered in the ACP. All sites that do not host optimization cells are border sites.
Selection	Uses sites selected in the map view.
Filter	Uses sites selected by using a pre-defined filter
Back	Moves to the previous window
Next	Moves to the next window

Set Threshold Parameters

Use this procedure to set threshold parameters and define threshold groups for automatic cell planning. Threshold parameters are used to calculate penalties for different geographical areas. The thresholds are those that the ACP should attempt to achieve, and include the penalty in any bin for not achieving the thresholds.

Window to Use

Use the **Automatic cell planning - Thresholds** window to set basic cell planning options:



Fields on the Window

The following table describes the fields on the window:

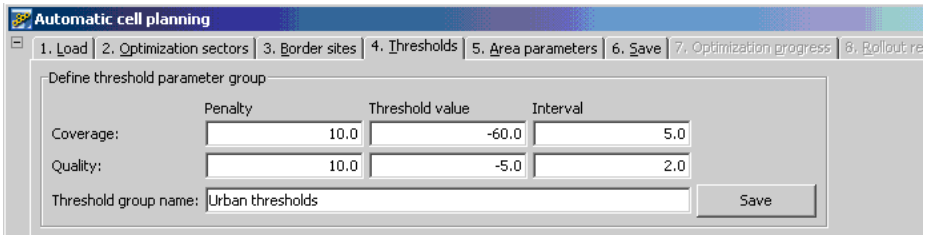
Field	Description
Coverage	Coverage parameters for: • Penalty - The penalty scoring value for a bin that violates the threshold • Threshold - The value at which a coverage penalty is triggered • Interval - Defines by how much the threshold must be exceeded before a full penalty is used. The penalty increases linearly from 0 in this interval.
Quality	Quality parameters for: • Penalty - The penalty scoring value for a bin that violates the threshold • Threshold - The value at which a penalty is triggered • Interval - Defines by how much the threshold must be exceeded before a full penalty is used. The penalty increases linearly from 0 in this interval.
Threshold group name	Name of the threshold group
Save	Saves the threshold group
Defined threshold groups	List of the defined threshold groups. By clicking on the name of a group, its parameters are displayed and can be modified. Clicking the group again deselects it and disregards changes. All changes are disregarded when you click on another group in the list.
Cost to penalty scale factor	Sector constraints cost values are multiplied with this factor before being compared with other penalty values
Set automatically	Automatically adjusts the cost to penalty scale factor to a suitable value. ACP runs a first calculation without considering the economical penalty. In the next round, the economical penalty is calculated, and this gives an indication of the average cost to decrease the penalty. Finally, the average cost efficiency is calculated, and the cost to penalty scale factor is set to a value allowing only the changes with a cost efficiency better than the average cost efficiency.
Capacity penalty weight	Lost traffic in ASE is multiplied by this factor before being compared to other penalty values.
Delete	Deletes highlighted threshold group(s). If you delete a threshold group used in an area parameter mapping, the mapping is removed as well.
Back	Moves to the previous window
Next	Moves to the next window

Threshold Groups

Each threshold group contains the penalty, threshold values and interval for both coverage and quality.

Example Threshold Parameter Group

The following example shows a defined threshold parameter group:



For coverage, the threshold value is set to -60dBm. The interval defines the value that the threshold must exceed before a full penalty is applied. The penalty increases linearly from 0 in this interval. In this example, -60dBm will not produce a penalty, but from -61dBm to -65dBm a penalty is calculated according to the formula:

Penalty for a specific bin= [(threshold - actual value) / interval]*penalty

Relation Between Coverage and Quality

The relation between the coverage and the quality is determined by the penalties defined for coverage and quality. If you want to focus on coverage, then set the penalty higher for coverage.

You can analyze only the total penalty for the entire area and not penalty per bin.

Different Thresholds for Different Areas

You may want to define different threshold groups for different areas, for example, one for *suburban* and one for *urban thresholds*. The thresholds in the *suburban* threshold group are lower than the thresholds in the *urban thresholds* group. This can be useful when you want to have different thresholds for different areas. You can use these thresholds when you define area parameters. See Set Area Parameters, 9-15.

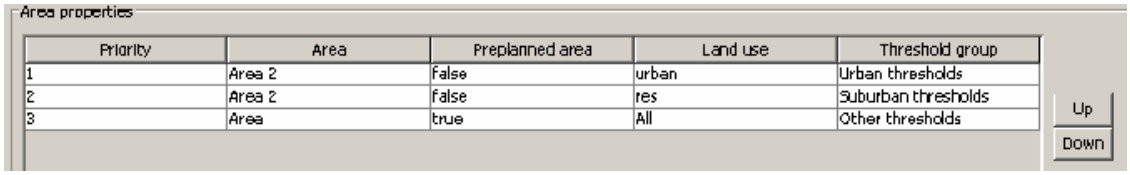
Set Area Parameters

Use this procedure to set ACP area parameters.

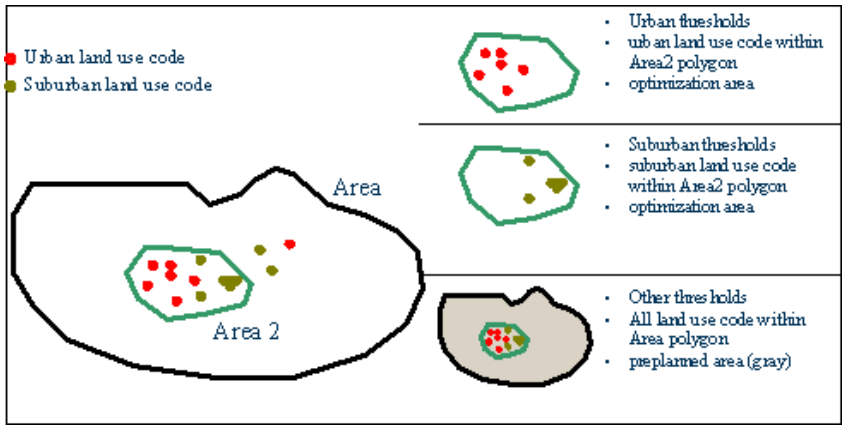
You define the optimization area and indicate the thresholds valid for selected land use codes. You can select several areas and define a threshold group and land use codes for each. You can also select a preplanned area.

Combining Areas, Thresholds and Land Use Codes

Using the Area parameters window, you can associate areas with thresholds and landuse codes, as shown in the following example:

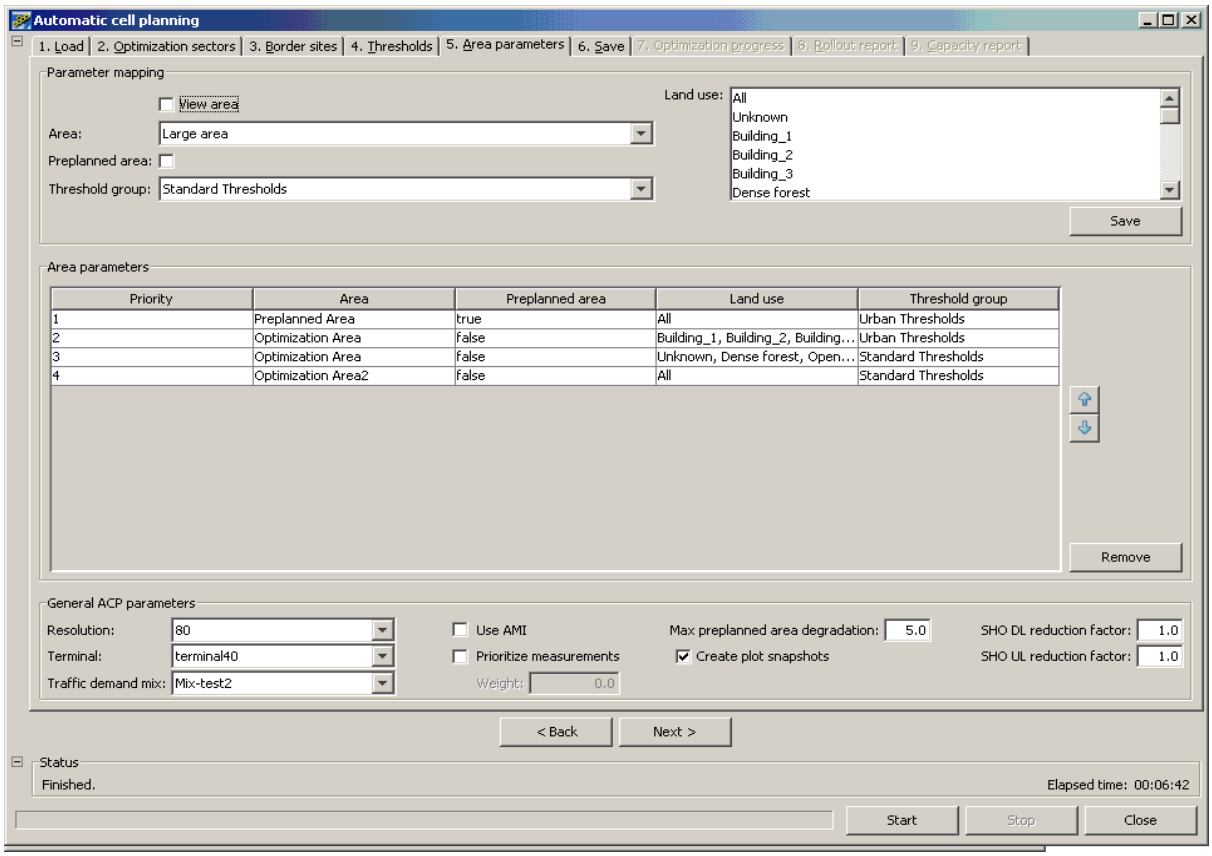


The following illustration shows how the combination of areas, thresholds, and land use codes defined in the example are used in automatic cell planning:



Window to Use

Use the **Automatic cell planning - Area parameters** window to set area parameters:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Area	The geographical area to use for planning. The area can be either the optimization area or the preplanned area.
Preplanned area	A preplanned area is an area where a defined degradation is allowed. The percentage of degradation is set in the **Area parameters** window with the **Maximum preplanned area degradation** field. This is the percentage of total penalty that can change in this area.
Land use	The land use codes within the selected area for which the threshold parameters should be used. You must select a minimum of one code. For any area, you can apply only the thresholds of specific land use codes.

Field	Description
Threshold group	Defines for a selected area the thresholds that should be the goal. The parameter group defines how the penalties are calculated for the bins of the area and land use combination. The defined threshold parameter groups are displayed in a list. When you delete a group in the **Set threshold parameters** window, it is removed from the list and also from any area parameter mapping to which it is assigned.
Area parameters	List of area parameters defined for cell planning, including: • Priority • Area • Preplanned area • Land use • Threshold group You can create several area parameter mappings. When two mappings overlap geographically, the order of the mappings may be important. You can adjust the mappings priority in the list.
Resolution	ACP pathloss resolution used during calculations. The larger the resolution, the faster the calculation. A more detailed resolution causes the calculations to take longer time. It is recommended to use a coarser resolution with the ACP. This allows the ACP to consider more solutions in a given time span, yielding a better result.
Terminal	One of the terminal types defined for WCDMA analysis in the project. For plot generation, the WCDMA analysis need a terminal type. It is important to use the same terminal if comparisons should be made with a plot generated outside the ACP.
Traffic demand mix	The traffic demand mix for capacity calculations. If no traffic demand mix is selected, capacity is not considered.
Use AMI	Indicates that data from an automatic measurement integration database is used. You define the path to the database in the **User settings** window.
Prioritize measurements	Indicates that survey data is given a higher weight when calculating penalties and gives the measurements higher weight than the predicted values *Example*: Consider two cells pointing toward each other. Both cells could easily cover the coverage area of the other cell. If measurements from only cell 1 exist, the penalty for cell 1 is much higher than from cell 2. It is possible that automatic cell planning will close cell 1 and increase the coverage from cell 2. The value for the weight must be larger than or equal to 1.0

Field	Description
Max preplanned area degradation	The value of the penalty increase acceptable for preplanned areas.
Create plot snapshots	Create plot snapshots of RSCP and Ec/Io plots before and after running automatic cell planning.
SHO DL reduction factor	ASE DL capacity reduction factor due to soft handover. 1.0 means that no capacity is lost, 0.0 means that all capacity is lost. This field has no effect when capacity optimization is not used.
SHO UL reduction factor	ASE UL capacity reduction factor due to soft handover. 1.0 means that no capacity is lost, 0.0 means that all capacity is lost. This field has no effect when capacity optimization is not used.
Back	Moves to the previous window
Next	Moves to the next window

Procedure

Follow these steps to start automatic cell planning:

1. Make entries in the fields as desired based on your earlier decisions.
2. Click Start. The Optimization progress window becomes active so you can watch the progress and determine when optimization is sufficient.

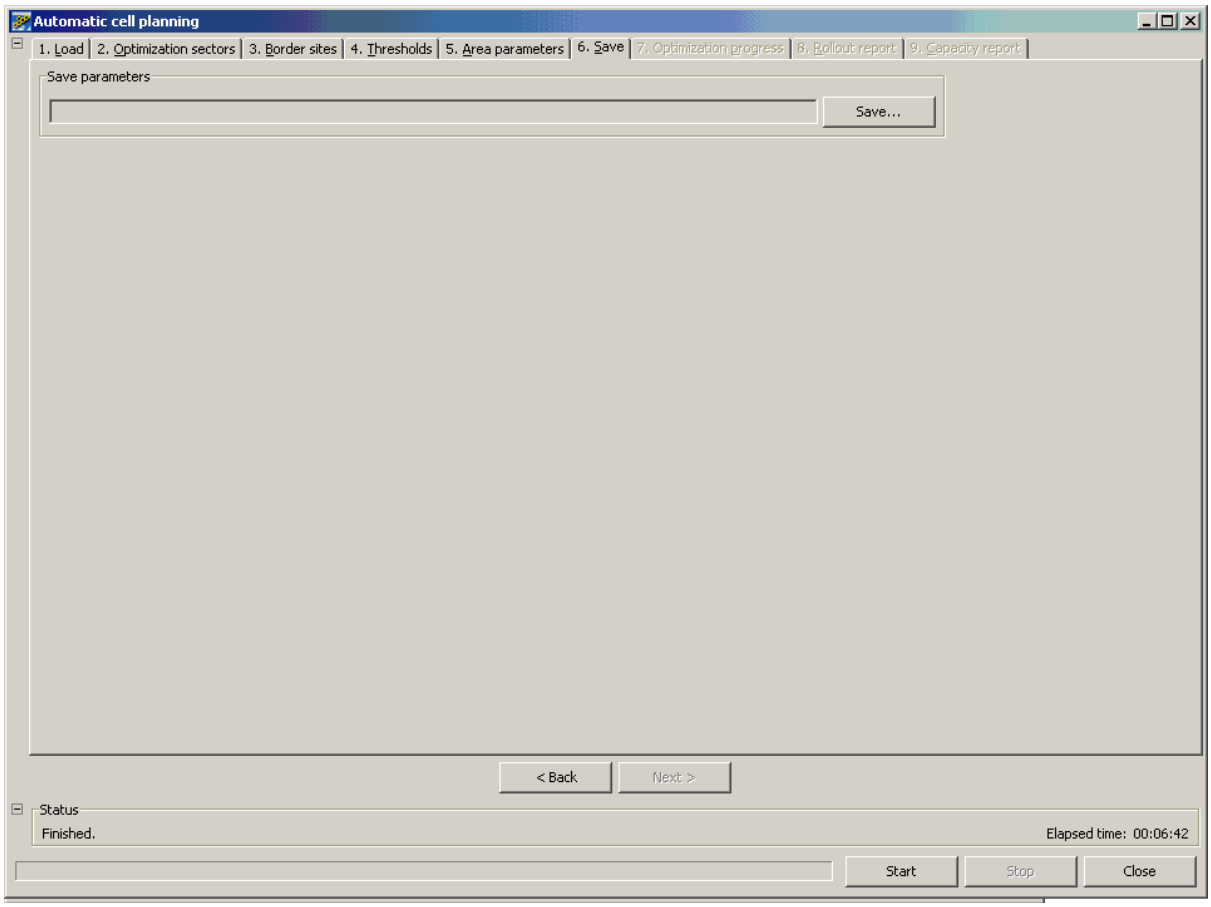
Save Automatic Cell Planning Parameters

Use this procedure to save the automatic cell planning parameters.

When you have made all settings, they can be saved as a template. You can load the parameters again in the **Load** window.

Window to Use

Use the **Automatic cell planning - Save** window to save automatic cell planning parameters to a file for later use:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Save	Saves the cell planning parameters in an XML file with a parameter set version number in the file name.
Back	Moves to the previous window
Next	Moves to the next window

Procedure

Follow these steps to save automatic cell planning settings for later use:

1. Click **Save**. A window is displayed so you can select the directory for saving the automatic cell planning settings.
2. Enter a file name, and click **OK**.

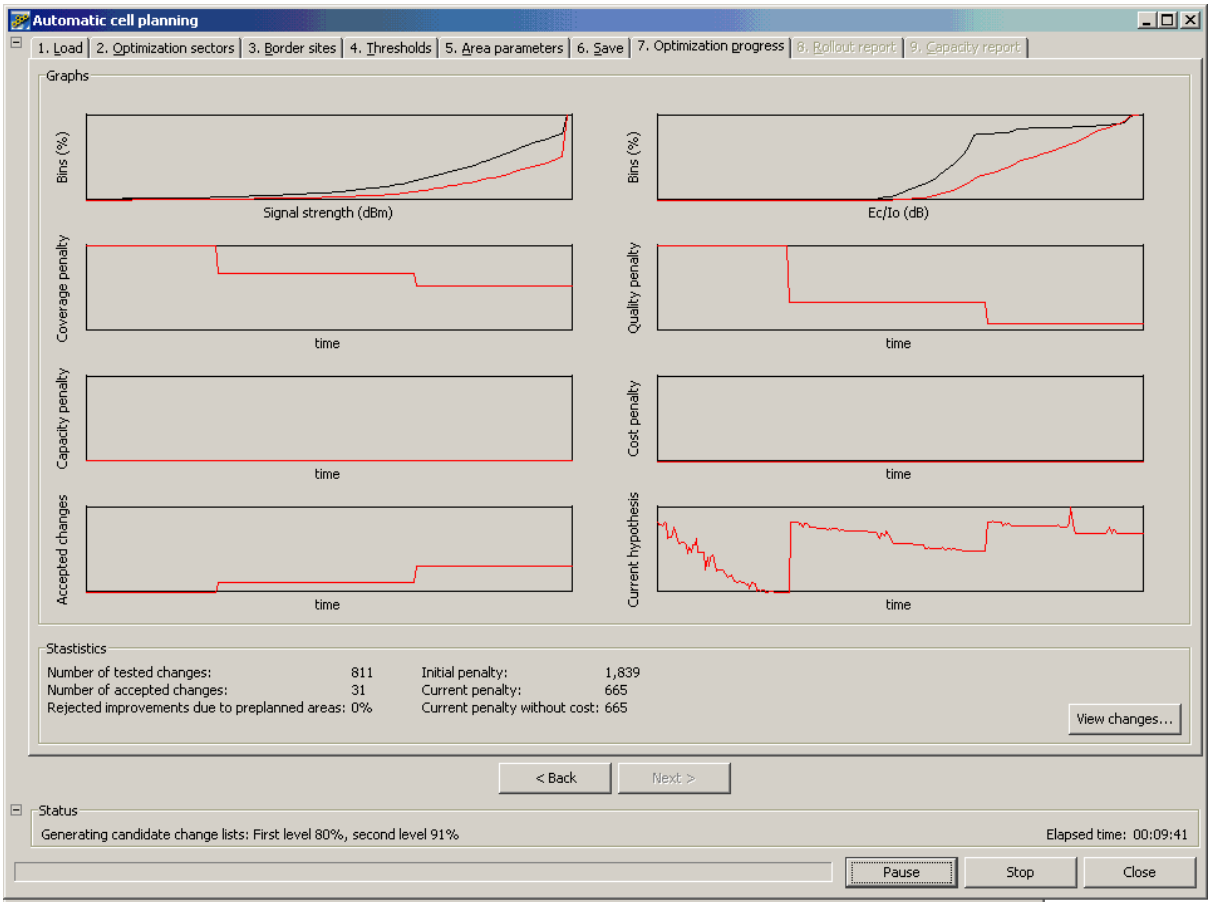
View Optimization Progress of Automatic Cell Planning

Use this procedure to view the progress of the automatic cell planning process. The **Progress** window becomes active when you start automatic cell planning.

The current penalties, the distribution of signal strength, Ec/Io over the analyzed bins, the number of changes and the cumulative signal strength and quality are displayed. When you place the mouse pointer on any of the graphs, the current status is displayed, as shown in the example. Monitoring the progress of the optimization lets you know when you want to stop the process.

Window to Use

Use the **Automatic cell planning - Optimization progress** window to set basic cell planning options:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Bins (%) signal strength (dBm)	The number of bins with a specific cumulative signal strength (dBm). The black graph shows the original status and the red graph shows the current status.
Coverage penalty	The total coverage penalty calculated for the optimization area.
Capacity penalty	The total capacity penalty calculated for the optimization area.
Accepted changes	Changes accepted for optimization. Accepted changes may differ from the rollout plan when you stop the process, because a cell may have an accepted change, but after continued processing, the cell is changed again.
Bins (%) Ec/Io (dB)	The number of bins with a certain cumulative quality (Ec/Io). The black graph shows the original status and the red graph shows the current status.
Quality penalty	The total quality penalty calculated for the optimization area.
Cost penalty	The total cost penalty calculated for the optimization area.
Current hypothesis	Displays various solutions found during processing.
Number of tested changes	Number of changes tested.
Number of accepted changes	Number of accepted changes.
Rejected improvements due to preplanned areas	Changes rejected because of preplanned areas.
Initial penalty	The initial penalty when you started optimization.
Current penalty	The sum of all total penalties.
Current penalty without cost	The sum of all total penalties, excluding the cost penalty.
View changes	Displays details for the accepted changes in the ACP sector changes window, showing sector name, changed parameter, and old and new values.
Back	Moves to the previous window
Next	Moves to the next window

View, Optimize and Apply Automatic Cell Planning Results

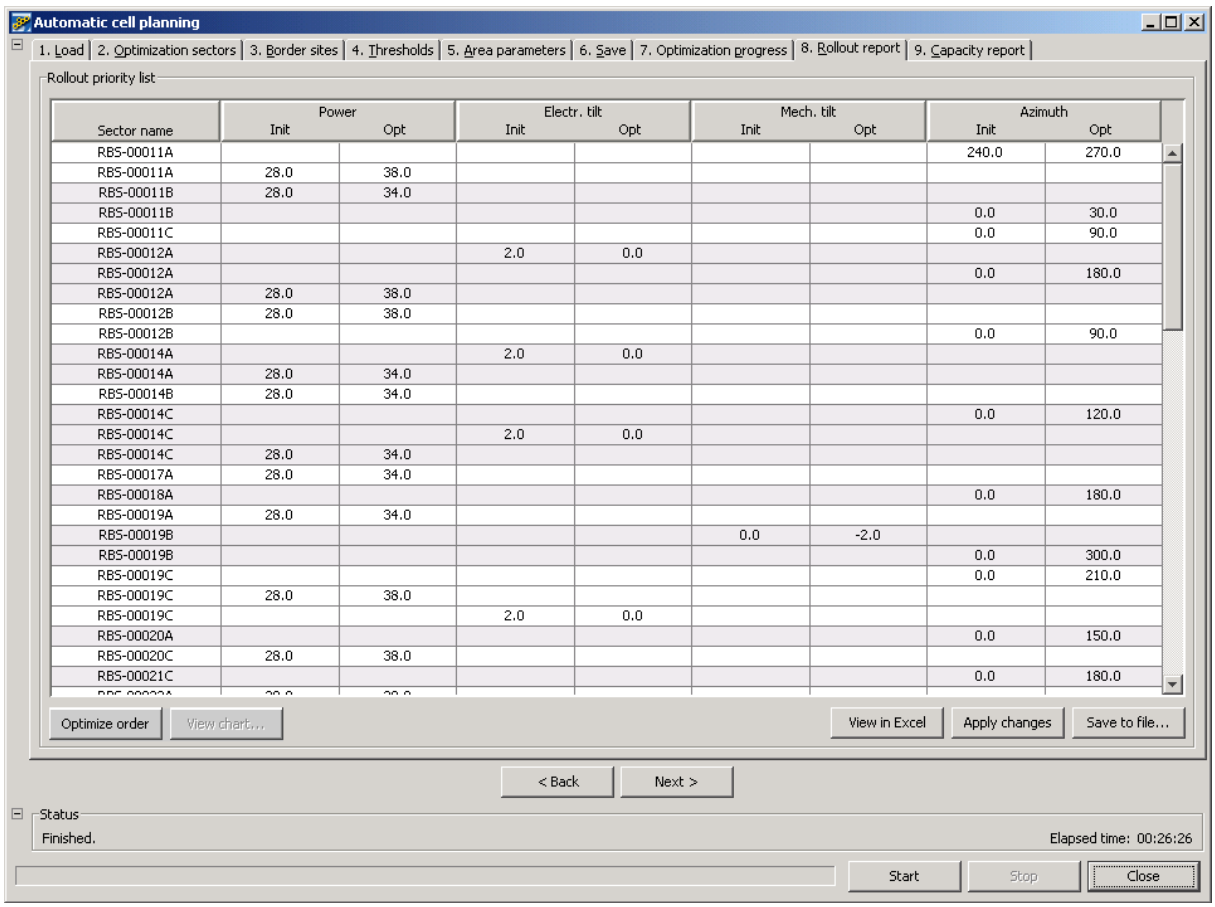
Use this procedure to view and apply the results of automatic cell planning, and to optimize the order of rollout.

The **Rollout report** window becomes active when you stop automatic cell planning. The window displays the sector changes that automatic cell planning has found to give the lowest penalties. You can apply the results to individual or all sectors.

The **Optimize order** sorts the changes so that the changes with the highest penalty improvement are at the top of the list.

Window to Use

Use the Automatic cell planning - Rollout report window to view the rollout report and results of automatic cell planning:



Sector name	Power Init	Power Opt	Electr. tilt Init	Electr. tilt Opt	Mech. tilt Init	Mech. tilt Opt	Azimuth Init	Azimuth Opt
RBS-00011A							240.0	270.0
RBS-00011A	28.0	38.0						
RBS-00011B	28.0	34.0						
RBS-00011B							0.0	30.0
RBS-00011C							0.0	90.0
RBS-00012A			2.0	0.0				
RBS-00012A							0.0	180.0
RBS-00012A	28.0	38.0						
RBS-00012B	28.0	38.0						
RBS-00012B							0.0	90.0
RBS-00014A			2.0	0.0				
RBS-00014A	28.0	34.0						
RBS-00014B	28.0	34.0						
RBS-00014C							0.0	120.0
RBS-00014C			2.0	0.0				
RBS-00014C	28.0	34.0						
RBS-00017A	28.0	34.0						
RBS-00018A							0.0	180.0
RBS-00019A	28.0	34.0						
RBS-00019B					0.0	-2.0		
RBS-00019B							0.0	300.0
RBS-00019C							0.0	210.0
RBS-00019C	28.0	38.0						
RBS-00019C			2.0	0.0				
RBS-00020A							0.0	150.0
RBS-00020C	28.0	38.0						
RBS-00021C							0.0	180.0

Fields on the Window

The fields on the window are described in chapter Using the ACP Wizard, section View, Optimize and Apply ACP Results

Procedure

The procedure to view the results, optimize the order of changes and apply the results are described in chapter Using the ACP Wizard, section View, Optimize and Apply ACP Results.

Exclude Trailing Changes

The most efficient changes are shown first in the list of ordered changes. If the penalty reduction of the last changes is low compared to the cost of carrying them out, the last part can be excluded from the rollout plan.

Avoid Excluding Single Changes

The ideal list of changes is visualized as a constantly decreasing curve in the histogram. If the ACP proposes a single change that does not seem to improve the penalty, or even increases the penalty compared to preceding changes, the change is not excluded from the list of changes, because it required for subsequent changes.

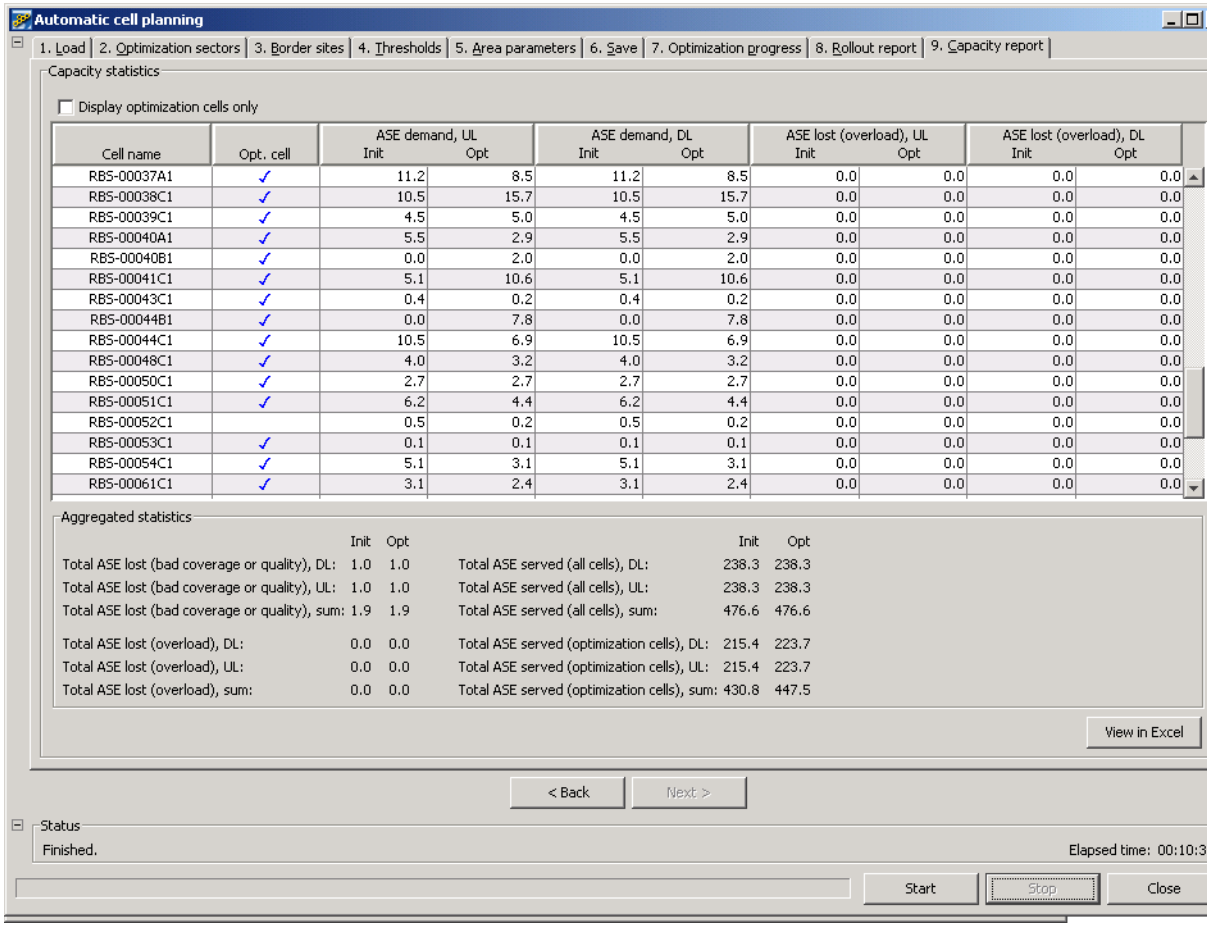
The penalty of an individual change depends on all preceding changes, and excluding one of the proposed changes would make the evaluation of the subsequently proposed changes invalid. If an initial subset of the list is used, and such a change is the final change in the subset, it can be discarded.

Multiple Changes at Site Visit

Co-sited changes that require site visit get the same penalty. Such changes are assumed to be made during the same site visit. Changing mechanical tilt or azimuth are examples of operations that require a site visit.

View Capacity after Automatic Cell Planning

Use this window to compare the capacity before and after automatic cell planning.



Fields on the Window

The fields on the window are described in chapter Using the ACP Wizard, section View Capacity Report.

Procedure

To view the capacity report in Excel format, click **View in Excel**. The optimization cells are marked with an asterisk, *.

Structure of Sector Information for Import/Export

Sector configuration information must match the Excel template structure in order for the import to be successful.

Electrical Tilt

The electrical tilt has no step or constraint type parameters as the possible electrical tilt values depend on the configuration of the sector antenna type.

Unchanged Parameters

If a parameter should not be used for optimization (the calculations should not change the parameter or assign a monetary cost), leave the cell values empty.

Excel Template / Structure

All constraints for a specific sector must be listed on one row in the spreadsheet. The constraints for the second sector are listed on the next row, and so forth.

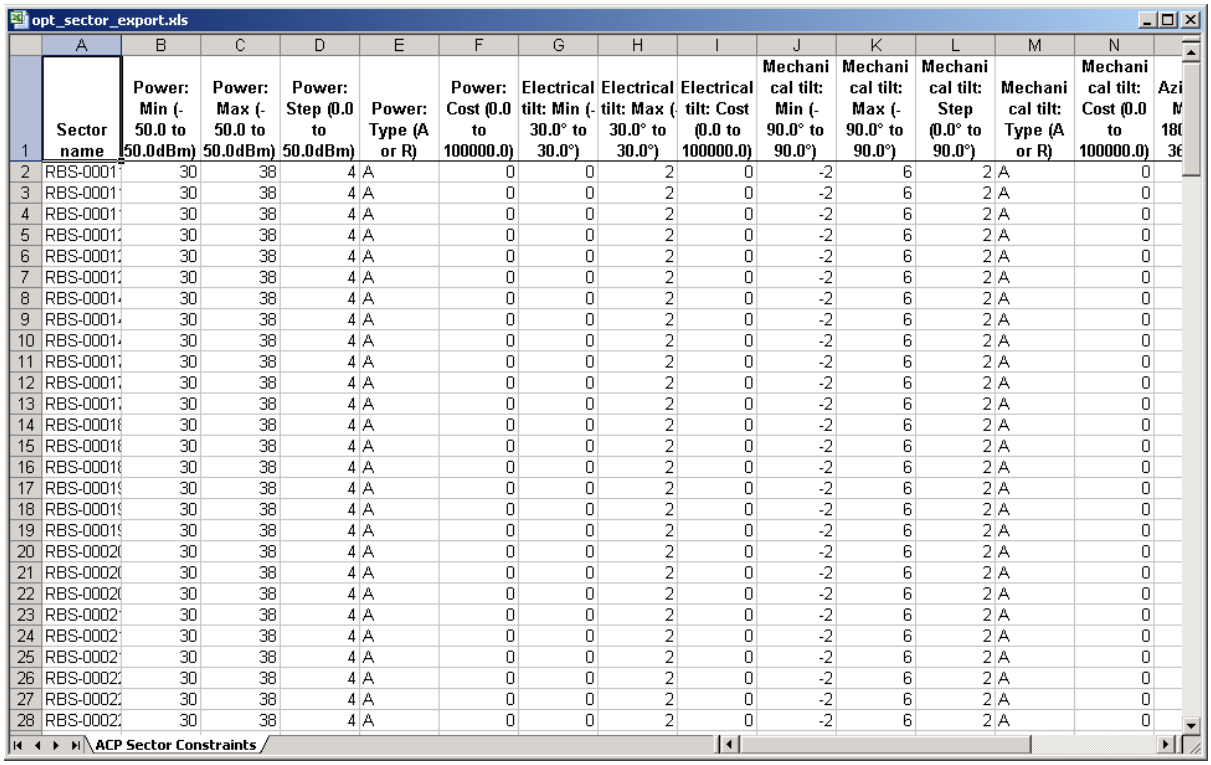
Columns in the spreadsheet contain the following parameters in column order:

Column	Description
1	Sector user label as they are given in the project [Text]
2	Minimum CPICH output power in dBm, a value between -50 and +50 [Number]
3	Maximum CPICH output power in dBm, a value between -50 and +50 [Number]
4	Step interval used to change the CPICH output power value in dBm, a value between 0 and +50 [Number]
5	Constraint type that defines if the minimum and maximum CPICH output power values shall be interpreted as relative to the original value or as absolute values [Text] • A = Absolute values • R = Relative values
6	Monetary cost for changing CPICH output power [Number]
7	Minimum electrical tilt in degrees, a value between -30 and +30 [Number]
8	Maximum electrical tilt in degrees, a value between -30 and +30 [Number]
9	Monetary cost for changing electrical tilt [Number]
10	Minimum mechanical tilt in degrees, a value between -90 and +90 [Number]
11	Maximum mechanical tilt in degrees, a value between -90 and +90 [Number]
12	Step interval used to change the mechanical tilt in degrees, a value between 0 and +90 [Number]

Column	Description
13	Constraint type that defines if the minimum and maximum mechanical tilt values shall be interpreted as relative to the original value or as absolute values [Text] • A = Absolute values • R = Relative values
14	Monetary cost for changing mechanical tilt [Number]
15	Minimum antenna azimuth in degrees, a value between -180 and +360 [Number]
16	Maximum antenna azimuth in degrees, a value between -180 and +360 [Number]
17	Step interval used to change the antenna azimuth in degrees, a value between 0 and +360 [Number]
18	Constraint type that defines if the minimum and maximum antenna azimuth values shall be interpreted as relative to the original value or as absolute values [Text] • A = Absolute values • R = Relative values
19	Monetary cost for changing antenna azimuth [Number]
20	Monetary cost for a site visit [Number]

Example Spreadsheet

The following example shows a simple export file for automatic cell planning:



opt_sector_export.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Sector name	Power: Min (-50.0 to 50.0dBm)	Power: Max (-50.0 to 50.0dBm)	Power: Step (0.0 to 50.0dBm)	Power: Type (A or R)	Power: Cost (0.0 to 100000.0)	Electrical tilt: Min (-30.0° to 30.0°)	Electrical tilt: Max (-30.0° to 30.0°)	Electrical tilt: Cost (0.0 to 100000.0)	Mechanical tilt: Min (-90.0° to 90.0°)	Mechanical tilt: Max (-90.0° to 90.0°)	Mechanical tilt: Step (0.0° to 90.0°)	Mechanical tilt: Type (A or R)	Mechanical tilt: Cost (0.0 to 100000.0)	Azi M 180 3(
2	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
3	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
4	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
5	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
6	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
7	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
8	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
9	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
10	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
11	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
12	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
13	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
14	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
15	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
16	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
17	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
18	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
19	RBS-0001	30	38	4	A	0	0	2	0	-2	6	2	A	0	
20	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
21	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
22	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
23	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
24	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
25	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
26	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
27	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	
28	RBS-0002	30	38	4	A	0	0	2	0	-2	6	2	A	0	

ACP Sector Constraints

Troubleshooting Sector Information Import/Export

General Problems

A number of possible problems that can occur during import and export:

- Configuration file cannot be found
- The file cannot be read, written to, or opened
- The file contents do not conform to the defined structure
- Sector user labels may be misspelled or may not exist in the current project
- Constraints parameters may be outside the defined limitations
- Constraint parameters may be entered incorrectly, for example, the maximum value is smaller than the minimum value, or the step interval is larger than the difference between the maximum and minimum.

10
Planning Neighbor Lists

This chapter describes how to generate neighbor lists, evaluate lists, apply the results to a WCDMA project plan, and display the results in the map window.

Chapter Neighbors in the *TEMS CellPlanner Common Features User's Guide* **contains a more up-to-date description on how you can add, modify and delete neighbors. The descriptions below will be aligned in a later release.**

Topics **Page**

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Background of Neighbor List Planning

TEMS CellPlanner can calculate a list of neighbors of all WCDMA cells included in a selected traffic demand/WCDMA terminal mix. Neighbor candidates are selected by the same or another mix. Traffic distribution is not required.

Using filters, you can select the set of cells to be included in the analysis.

When you generate, import or load a neighbor list, you can evaluate and edit the generated neighbor list before saving it in the calculation results.

You can import neighbors cells from a file to the calculation results. You can export a neighbor list from the calculation results to a file.

After you apply neighbor list results to a WCDMA project, you can display all types of neighbor relations graphically in the map display window.

Output of Neighbor List Results

After you analyze neighbor lists and apply the calculation results to the project, the neighbor cell information is used to optimize scrambling codes.

Traffic Demand Mix and Terminal

When you generate neighbor lists, you specify the cells from which the neighbor relations are calculated by a combination of traffic demand mix and WCDMA terminal.

Import Existing Neighbors

Use **Neighbor import** available from the **File↗Import** menu to import existing neighbors in XML format. See the *TEMS CellPlanner Common Features User's Guide* for detailed information.

Neighbor List Qualifications

A neighbor list defines the set of cells to which a mobile station is allowed to perform a handover. Cells must meet certain qualifications to be considered.

Types of Cells for WCDMA Neighbor List Planning

For WCDMA, the cells are the selected by the combination of traffic demand mix and WCDMA terminal used to generate the lists.

Types of WCDMA Neighbor Lists

For a WCDMA cell, there are three types of neighbor lists:

- Intra-frequency neighbors: cells with the same technology and using the same carrier frequency as the origin cell. The system defined maximum of cells on this list is 31.
- Inter-frequency neighbors: cells with the same RAT but using another carrier frequency than the origin cell. The system defined maximum of cells on this list is 32.
- Inter-technology neighbors: cells with a radio technology other than the origin cell. The system defined maximum of cells on this list is 32.

Generate WCDMA Neighbor Lists

Use this procedure to generate lists of WCDMA cells that are neighbors of other cells in a WCDMA network plan.

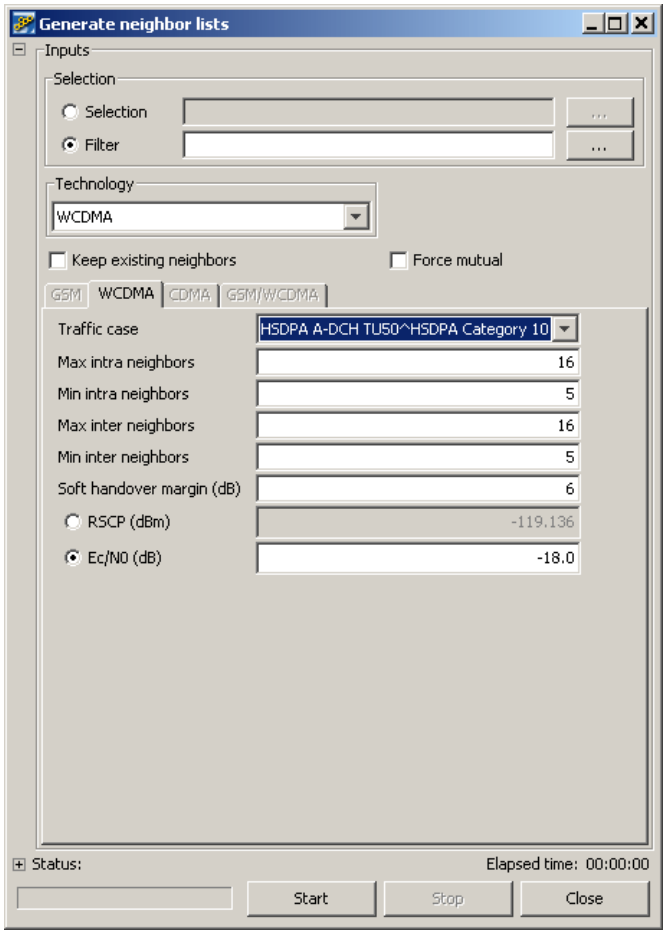
Prerequisites

Before generating neighbor lists, you must create:

- The composite pathloss matrix (CPLM)
- One or more best server plots for WCDMA traffic demand mixes (bearer plus terminal).

Window to Use

Use the Generate neighbor lists window to generate a neighbor list for a WCDMA network plan:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Technology	The network technology to use for list generation.
Keep existing neighbors	Any neighbor relations existing in the project are maintained during neighbor list generation.
Force mutual	Forces the neighbor relations on the list to be mutual.
Traffic case	A traffic case is a combination of a traffic demand mix and terminal. The traffic case containing the candidate neighbor cells.
Max intra neighbors	The maximum length of the neighbor list generated between cells with the same frequencies. Max = 31
Min intra neighbors	The minimum length of the neighbor list generated between cells with the same frequencies.
Max inter neighbors	The maximum length of the neighbor list generated between cells using different frequencies. Max = 32
Min inter neighbors	The minimum length of the neighbor list generated between cells using different frequencies.
Soft handover margin (dB)	Soft handover margin in dB for the WCDMA intra frequency neighbors.
RSCP (dBm)	Received Signal Code Power in dBm.
Ec/No (dB)	The minimum signal quality of the pilot (or CPICH) required for a target cell using WCDMA (or WCDMA). Initial Value -18 dB

Procedure

Follow these steps to generate neighbor lists for a WCDMA network plan:

1. Select Analysis↗Neighbor list↗Generate neighbor lists to display the Generate neighbor lists window.
2. In the technology list, select WCDMA.
3. Select a traffic demand/terminal combination for the traffic case.
4. Make entries in other fields as required.
5. Click Start to generate neighbor lists.

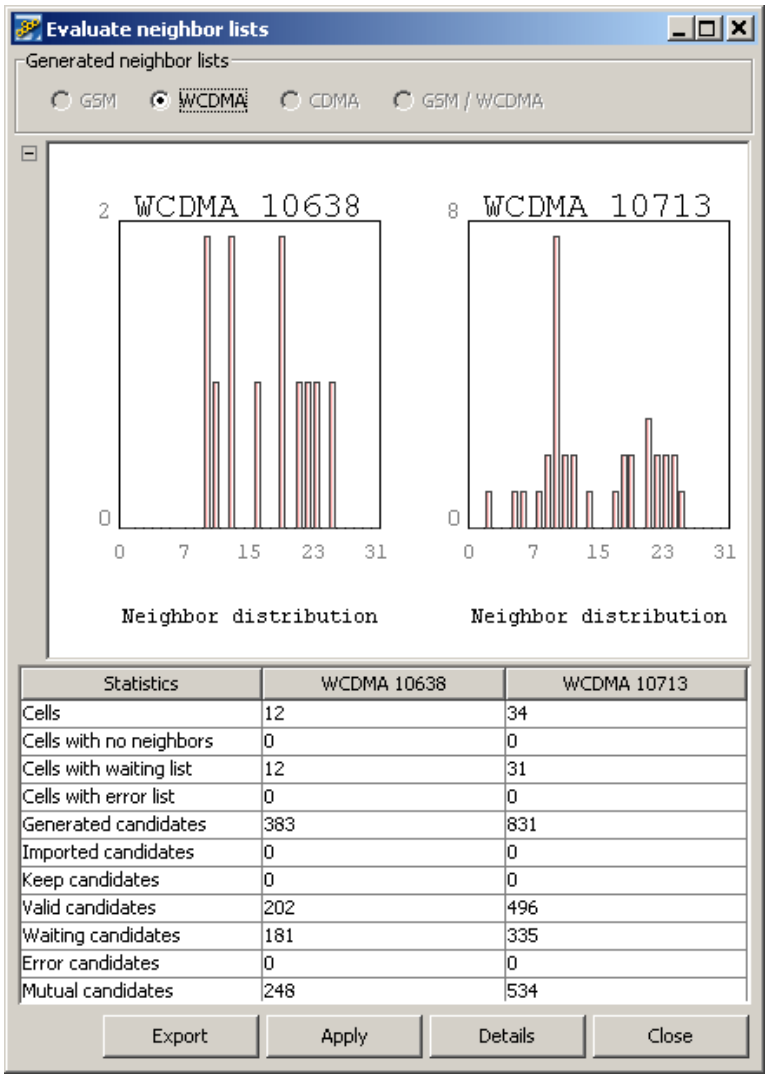
Evaluate WCDMA Neighbor Lists

Use this procedure to evaluate the generated neighbor list for a WCDMA network plan. The list shows the candidate neighbors for the origin cell and selected neighbor list.

You can retain the neighbor relations already in the calculation results, and those relations will then be copied to the list of neighbor candidates.

Window to Use

Use the **Evaluate neighbor lists** window to view analysis results:



Statistics	WCDMA 10638	WCDMA 10713
Cells	12	34
Cells with no neighbors	0	0
Cells with waiting list	12	31
Cells with error list	0	0
Generated candidates	383	831
Imported candidates	0	0
Keep candidates	0	0
Valid candidates	202	496
Waiting candidates	181	335
Error candidates	0	0
Mutual candidates	248	534

Fields on the Window

The following table describes the fields on the window:

Field	Description
Generated neighbor lists	Selection of technology for which to display neighbor lists. Relevant if other technologies than WCDMA included in the project.
Neighbor distribution chart	Histogram over neighbor distribution. The x axis displays the number of neighbors, the y axis the number of cells.
(neighbor statistics)	For each WCDMA frequency band, the neighbor statistics include: • Number of cells • Number of cells with no neighbors • Number of cells with waiting list • Number of cells with error list • Total number of generated candidates • Total number of imported candidates • Total number of keep candidates • Total number of valid candidates • Total number of waiting candidates • Total number of error candidates • Total number of mutual candidates
Export	Exports the neighbor list to a text file.
Apply	Applies the neighbor relations to the network plan.
Details	Displays details of the neighbor relations generated.

Procedure

Follow these steps to view neighbor lists results:

1. In the **Evaluate neighbor lists** window, select a cell.
2. Its neighbors (cells with an overlap exceeding 10%) and non-neighbors (cells with an overlap between 0 and 10%) are displayed. Cells with no overlap are not displayed.

Important: To feed back the changes to the cell neighbor lists in the project, you must click **Apply** in the **Evaluate neighbor lists** window.

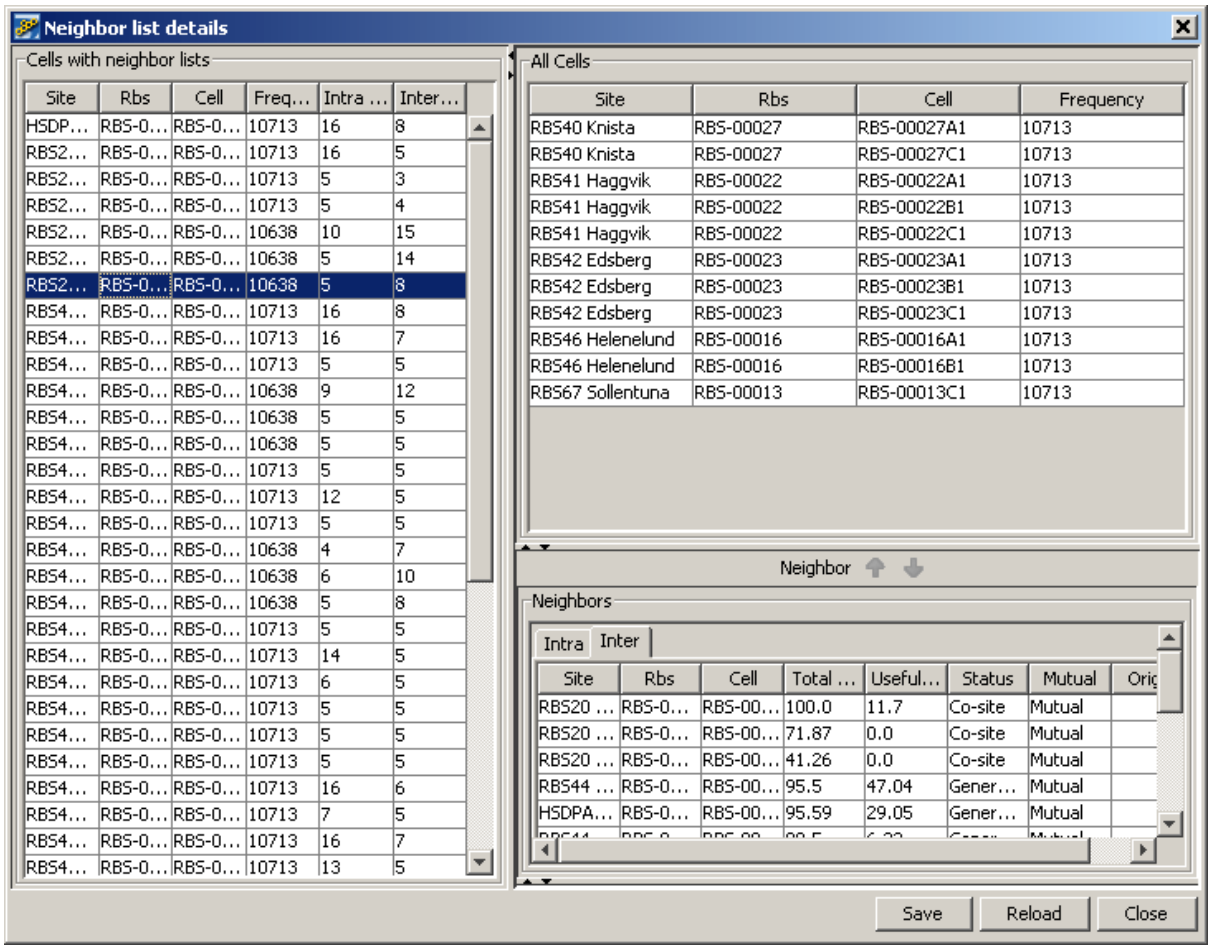
Evaluate Details of Neighbor Lists

The **Neighbor list details** window displays a list of all origin cells considered in the neighbor list generation.

For each neighbor, the lists shows the cell ID along with the neighbor relation status, and the percentages of the useful overlap and total overlap of the origin and target neighbor cells.

Window to Use

Use the **Neighbor list details** window to work with details of neighbor lists:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Cells with neighbor lists	All cells on the generated list with neighbors
All cells	All cells in the network plan
Neighbor ↑ ↓	To move a cell from the **neighbors** list to the **waiting** list, click on the down arrow. To move a cell from the **waiting** list to the **neighbors** list, click on the up arrow.
Neighbors	List of neighbors for the cell selected in the Cells with neighbors list
Neighbor ↑ ↓	To move a cell from the **neighbors** list to the **waiting** list, click on the down arrow. To move a cell from the **waiting** list to the **neighbors** list, click on the up arrow.
Waiting list	A list of candidates for neighbors of the origin cell.
Error list	A list of cells that do not qualify as neighbors of the origin cell.
Save	Saves the current neighbor list to the calculation results directory. You can reload the saved list at a later time.
Reload	Reloads a saved neighbor list from the calculation results directory.

Add/Remove Neighbor Relationships

You can add Neighbor relations to the neighbor list or the waiting list using the up/down arrows on the Neighbor list details window.

You can remove Neighbor relations from the list.

Neighbor List

The neighbor list provides separate tabs for intra-cell and inter-cell neighbors. It shows the **Total overlap** of cell neighbor boundaries and **Useful overlap**. For WCDMA, **useful overlap** means that the signal strength is within the soft handover margin. Both values are expressed as percentages of the cells' best server area.

The following table describes the available status conditions for cells on the **Neighbor** list:

Status	Description
Keep	Relation kept from the project, if you selected the "keep" option during neighbor list generation.
Generated	Neighbor relation generated by neighbor list generation.
Added by user	Relation added by the user after neighbor list generation.
Co-site	Candidate neighbor cell located at same site.
Imported	Neighbor relation imported from file.

Waiting List

The following table describes the available status conditions for cells on the **Waiting list**:

Status	Description
No useful overlap	Indicates that none of the cells are within the handover margin.
Exceeded list length	Candidates on the waiting list are there because the list of qualified neighbors reached the maximum allowed.

Error List

The following table describes the available status conditions for cells on the **Error list**:

Status	Description
Deleted by user	Neighbor relation removed from the Neighbor List
Wanted by reverse Neighbor	The target cell's Neighbor list has the maximum neighbor relations. Force mutual cannot be achieved due to maximum neighbors.

Import Generated Neighbor Lists

Use this procedure to import neighbor lists to use when analyzing neighbor lists.

You can import, merge neighbor lists, edit the merged list, and then apply the edited list to the calculation results.

Priority for Importing

If neighbor relations already exist in the calculation results, you can specify whether the imported relations should replace the old ones, or be merged with them.

When you merge neighbor lists, you can indicate higher or lower priority for the old relations.

TEMS CellPlanner places the imported relations on the neighbor candidate list in priority order and in the same order as they had in the input file. If duplicate relations exist, the relation with the lowest priority is merged into the relation with highest priority. After the import is finished, the program limits the number of relations.

Import to Calculation Results Directory

This import option imports the neighbor lists to the selected calculation results directory of TEMS CellPlanner.

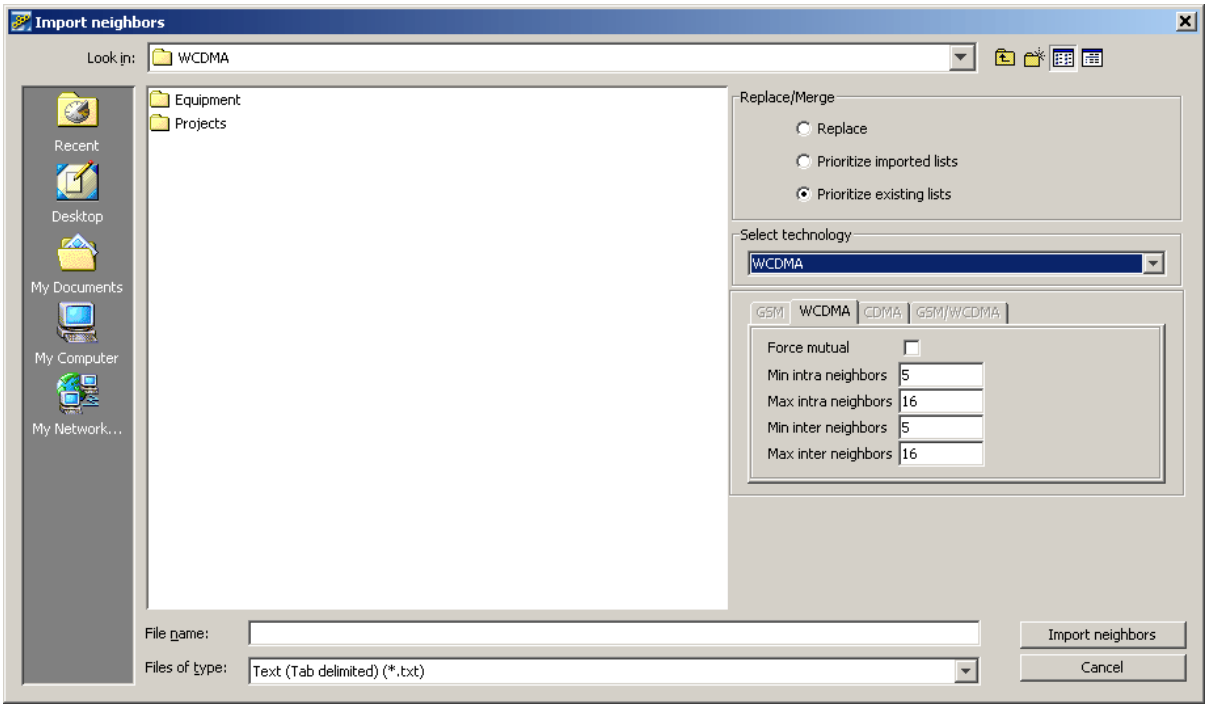
To import cell neighbors directly into the project, you must use the **Import cell neighbors text file** option, described in the *TEMS CellPlanner Common Features User's Guide*.

Prerequisites

You must have an existing neighbors file to import.

Window to Use

Use the **Import neighbors** window to import neighbor lists to the calculation results:



Fields on the Window

The following table describes the fields on the window:

Field	Description
(file list)	List of .txt files.
Replace	Replaces the existing calculation results with the imported file.
Prioritize imported lists	Gives first priority to the neighbor relations from the imported list.
Prioritize existing lists	Gives first priority to the neighbor relations from the existing list.
Select technology	Indicates the technology of the list to import.
Force mutual	Forces all cells to have mutual neighbor relations
Min intra neighbors	Minimum required neighbors within WCDMA
Max intra neighbors	Maximum allowed neighbors within WCDMA
Min inter neighbors	Minimum required neighbors between technologies
Max inter neighbors	Maximum allowed neighbors between technologies
Import neighbors	Imports the neighbor file

Procedure

Follow these steps to import a neighbor list:

1. Analysis↗Neighbor list↗Import to neighbor list. The **Import neighbors** window opens.
2. Select a .txt file from the list of files.
3. Select a Replace/Merge option.
4. Select a technology.
5. Select import parameters for the selected technology.
6. Click **Import neighbors**. The neighbor file is imported and either is merged with the existing list or replaces the existing list, so you can view details of the list and edit it if required.

Important: To feed back the changes to the cell neighbor lists in the project, you must click Apply in the Evaluate neighbor lists window.

Export Generated Neighbor Lists

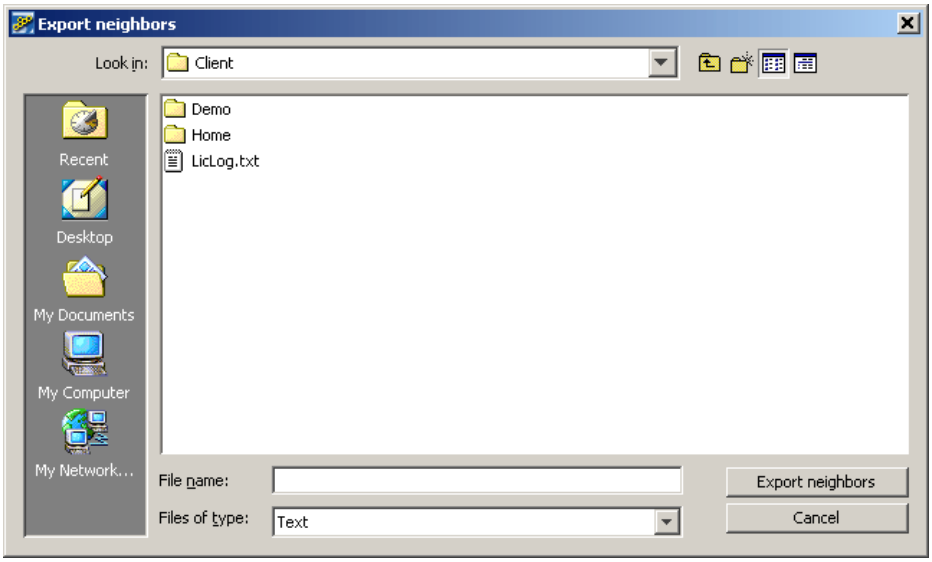
Use this procedure to export a neighbor list.

Prerequisites

Before you can export a neighbor list, you must evaluate the neighbor list.

Window to Use

Use the Export neighbors window to export neighbor lists to a text file:



Procedure

Follow these steps to export neighbor lists after evaluation:

1. Select Analysis↗Neighbor list↗Evaluate neighbor lists. The **Export neighbors** window is displayed.
2. Specify a path and name for the export file and click **Export neighbors**. The **file is created and a confirmation message is displayed**.

   The export file contains a line for every cell, with cells separated by tabs. The first cell is the serving cell while the rest of the cells are neighbors.

Generate WCDMA/GSM Neighbor Lists

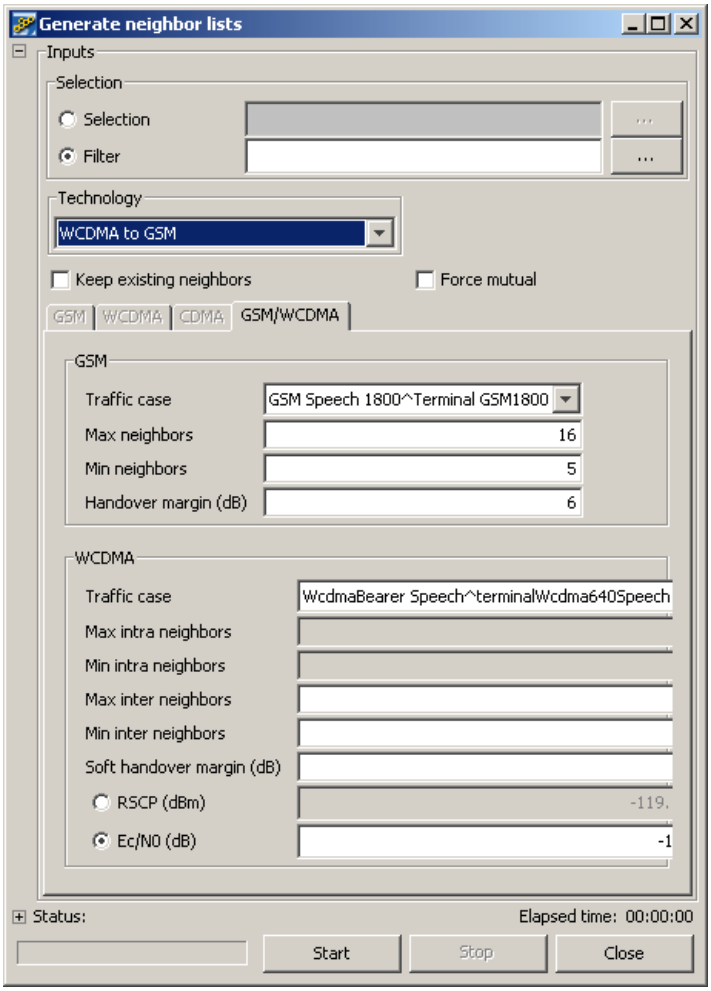
Use this procedure to create lists of GSM and WCDMA cells that are neighbors.

Neighbor Lists for GSM/WCDMA

For WCDMA, separate neighbor lists are created for intra-frequency and inter-frequency neighbors. One intra-frequency and one inter-frequency list is created for every WCDMA frequency. When there is only one frequency, only one intra-frequency list is created.

Window to Use

Use the **Generate neighbor lists** window to create a WCDMA/GSM neighbor list for a WCDMA network plan:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Technology	The network technology to use for list generation.
Keep existing neighbors	Any neighbor relations existing in the project are maintained during neighbor list generation.
Force mutual	Forces the neighbor relations on the list to be mutual.
Traffic case	The GSM traffic case to use in the analysis (the Traffic case containing the candidate neighbor cells).
Max neighbors	For GSM, the maximum neighbors allowed for origin cells
Min neighbors	For GSM, the minimum neighbors required for origin cells
Handover margin (dB)	GSM handover margin in dB.
Traffic case	The WCDMA traffic case containing the candidate neighbor cells
Max intra neighbors	For WCDMA, the maximum length of the neighbor list generated between cells with the same frequencies. Max = 31
Min intra neighbors	For WCDMA, the minimum length of the neighbor list generated between cells with the same frequencies.
Max inter neighbors	For WCDMA, the maximum length of the neighbor list generated between cells using different frequencies. Max = 32
Min inter neighbors	For WCDMA, the minimum length of the neighbor list generated between cells using different frequencies.
Soft handover margin (dB)	WCDMA soft handover margin in dB
RSCP (dBm)	Received Signal Code Power in dBm.
Ec/No (dB)	The minimum signal quality of the pilot (or CPICH) required for a target cell using WCDMA (or WCDMA). Initial Value -18 dB

Procedure

Follow these steps to generate neighbor lists for a WCDMA network plan:

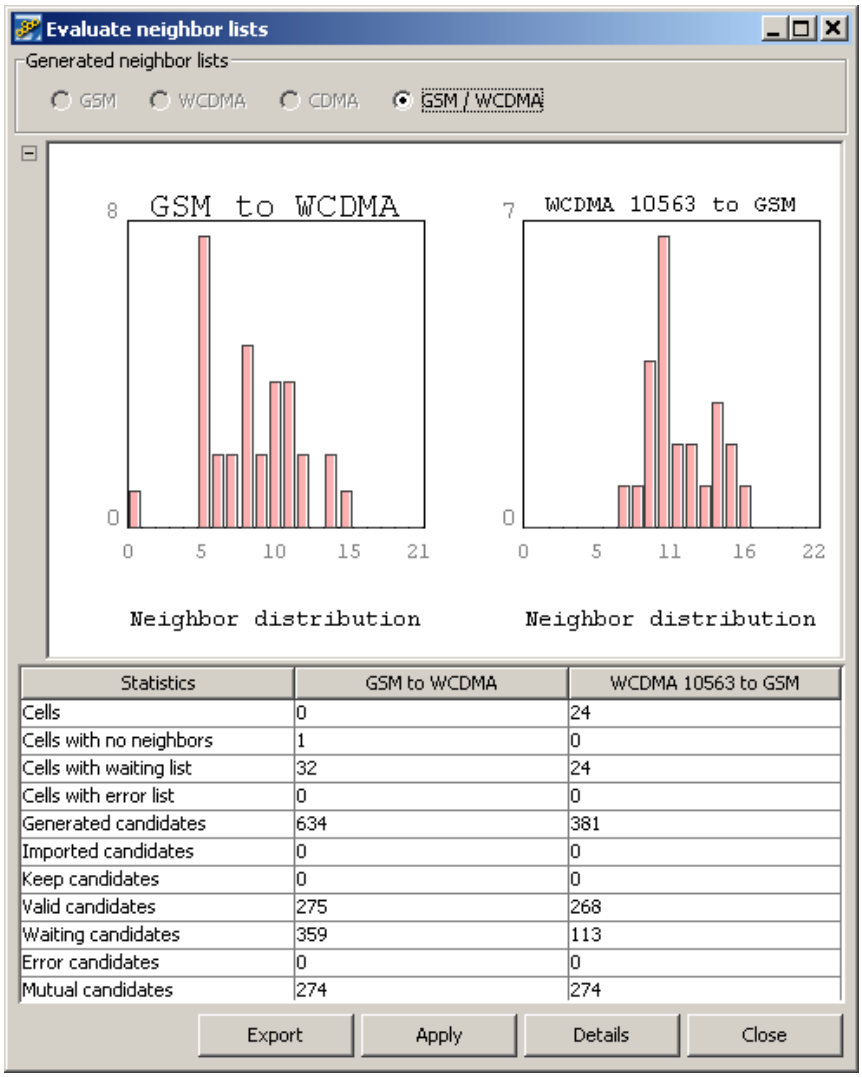
1. Select **Analysis↗Neighbor list↗Generate neighbor lists** to display the **Generate neighbor lists** window.
2. In the technology list, select **WCDMA**.
3. Select a traffic case.
4. Click **Start** to generate neighbor lists.

Evaluate WCDMA/GSM Neighbor Lists

Use this procedure to evaluate the generated neighbor list for a WCDMA/GSM network plan.

Window to Use

Use the **Neighbor list evaluation** window to view analysis results:



Statistics	GSM to WCDMA	WCDMA 10563 to GSM
Cells	0	24
Cells with no neighbors	1	0
Cells with waiting list	32	24
Cells with error list	0	0
Generated candidates	634	381
Imported candidates	0	0
Keep candidates	0	0
Valid candidates	275	268
Waiting candidates	359	113
Error candidates	0	0
Mutual candidates	274	274

Fields on the Window

The following table describes the fields on the window:

Field	Description
GSM	Displays neighbor lists generated for GSM
WCDMA	Displays neighbor lists generated for WCDMA
GSM/WCDMA	Displays neighbor lists generated for GSM and WCDMA
(neighbor statistics)	For each WCDMA frequency band, the neighbor statistics include: • Number of cells • Number of cells with no neighbors • Number of cells with waiting list • Number of cells with error list • Total number of generated candidates • Total number of imported candidates • Total number of keep candidates • Total number of valid candidates • Total number of waiting candidates • Total number of error candidates • Total number of mutual candidates
Export	Exports the neighbor list to a text file.
Apply	Applies the neighbor relations to the network plan.
Details	Displays details of the neighbor relations generated.

Procedure

Follow these steps to view neighbor lists:

1. In the **Evaluate neighbor lists** window, select a cell.
2. Its neighbors (cells with an overlap exceeding 10%) and non-neighbors (cells with an overlap between 0 and 10%) are displayed. Cells with no overlap are not displayed.

Important: To feed back the changes to the cell neighbor lists in the project, you must click **Apply** in the **Evaluate neighbor lists** window.

Add Individual Neighbor Relations

Use this procedure to add individual neighbor cell relations to the project. Neighbor cell relations are used to optimize scrambling codes, and are also used by the operations and maintenance system.

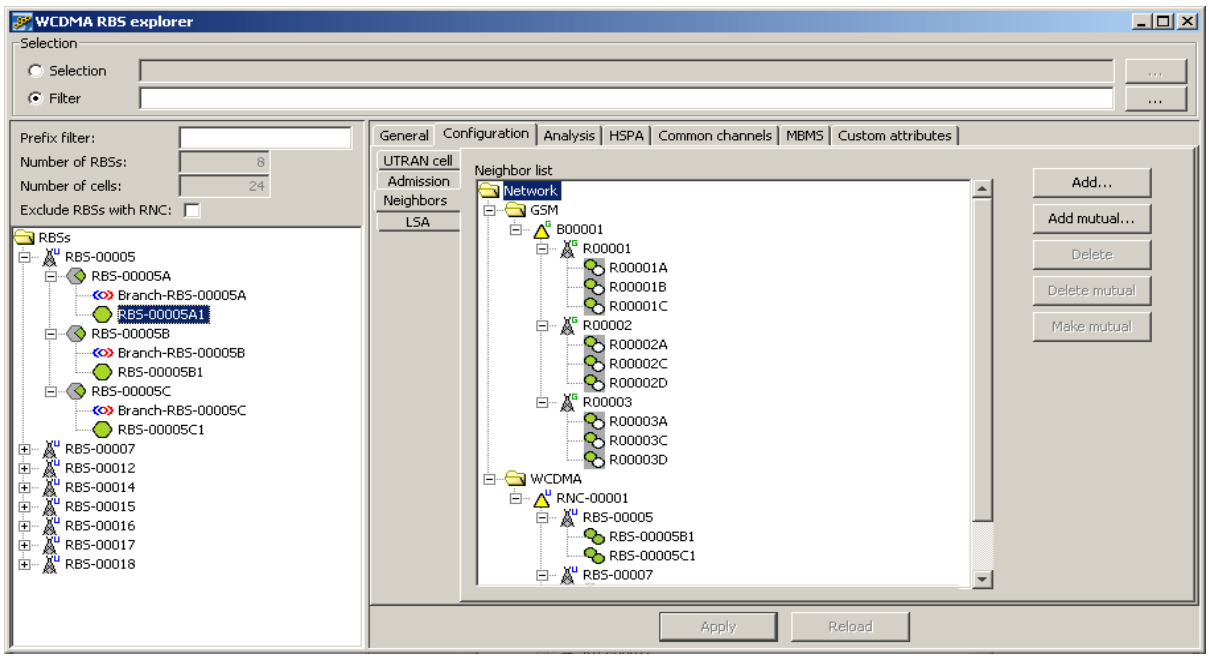
Adding and changing neighbor relations in this window updates the cell information in the project.

Prerequisites to Display Neighbor Relations

Load two network map layers, for example a WCDMA network layer and a GSM network layer.

Window to Use

Use WCDMA RBS explorer and select the **UTRAN Cell - Neighbor** window to add neighbor relations to cells.



Fields on the Window

The following table describes the fields on the window:

Field	Description
Neighbor list	Shows the neighbors for a cell, organized by technology and then by RBS. Mutual cell relationships are displayed with a double green cell icon. Non-mutual relationships are displayed with a green/white cell icon. The list indicates when the relation is mutual, meaning that the origin cell is also included on the neighbor list of the target cell.
Add...	Displays the **Cell selection (Add)** window for adding neighbor cells to the highlighted cell. Makes the cell relationship non-mutual.
Add mutual...	Displays the **Cell selection (Add mutual)** window for adding a mutual cell neighbor relationship.
Delete	Deletes a neighbor relationship from a cell.
Delete mutual	Deletes a mutual relationship from the original cell and its neighbor.
Make mutual	Makes a cell relationship mutual between two cells.

Procedure

Follow these steps to add neighbors to cells:

1. Using an RBS explorer, select the cell(s) for which to add neighbors.
2. Select **Configuration↗Neighbor** to display the **Neighbor List** window.
3. Highlight the folder of the technology appropriate for the neighbor cell to add as a relation, and right-click the mouse to display the **Cell selection (Add)** window.
4. In the RBS hierarchy displayed for the technology, select the RBS and cell to add as a neighbor relation.
5. Click **Add** to add the neighbor relation with the selected cell.

Display Neighbor Cells

Use this procedure to display neighbor cells graphically by colored site symbols or by lines.

Prerequisites

Before you can display neighbor cells, you must generate neighbor lists for at least one carrier and apply the generated list to the project data.

Neighbor Display by Lines

Lines are drawn from the serving cell to the neighbor cell position for each frequency band. Neighbor display by lines describes mutual neighbor information by colors you select. One serving cell points to neighbor cells by one line for each frequency band of a neighbor cell.

Lines may be divided in the middle of the line, to represent mutuality at the first part from the serving cell to the middle of the line, and the frequency band for the remainder of the line.

When finding more than one neighbor cell at a cell position, each cell position is considered to be on a line, separated by a small distance within the cell symbol.

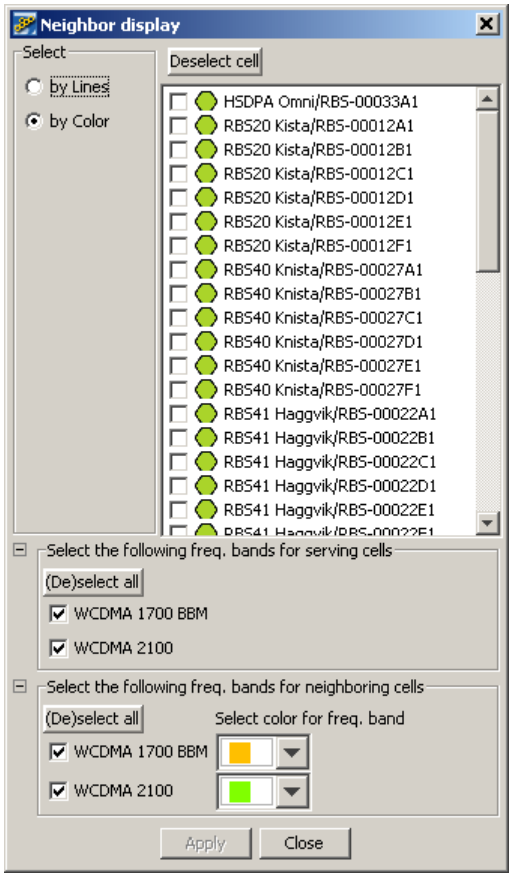
Neighbor Display by Colors

The serving cell is always red. The neighbor cell colors represent the frequency bands of the neighboring cells.

Mutual relations cannot be displayed color, in the serving cell.

Window to Use

Use the **Neighbor display** window to activate neighbor display:



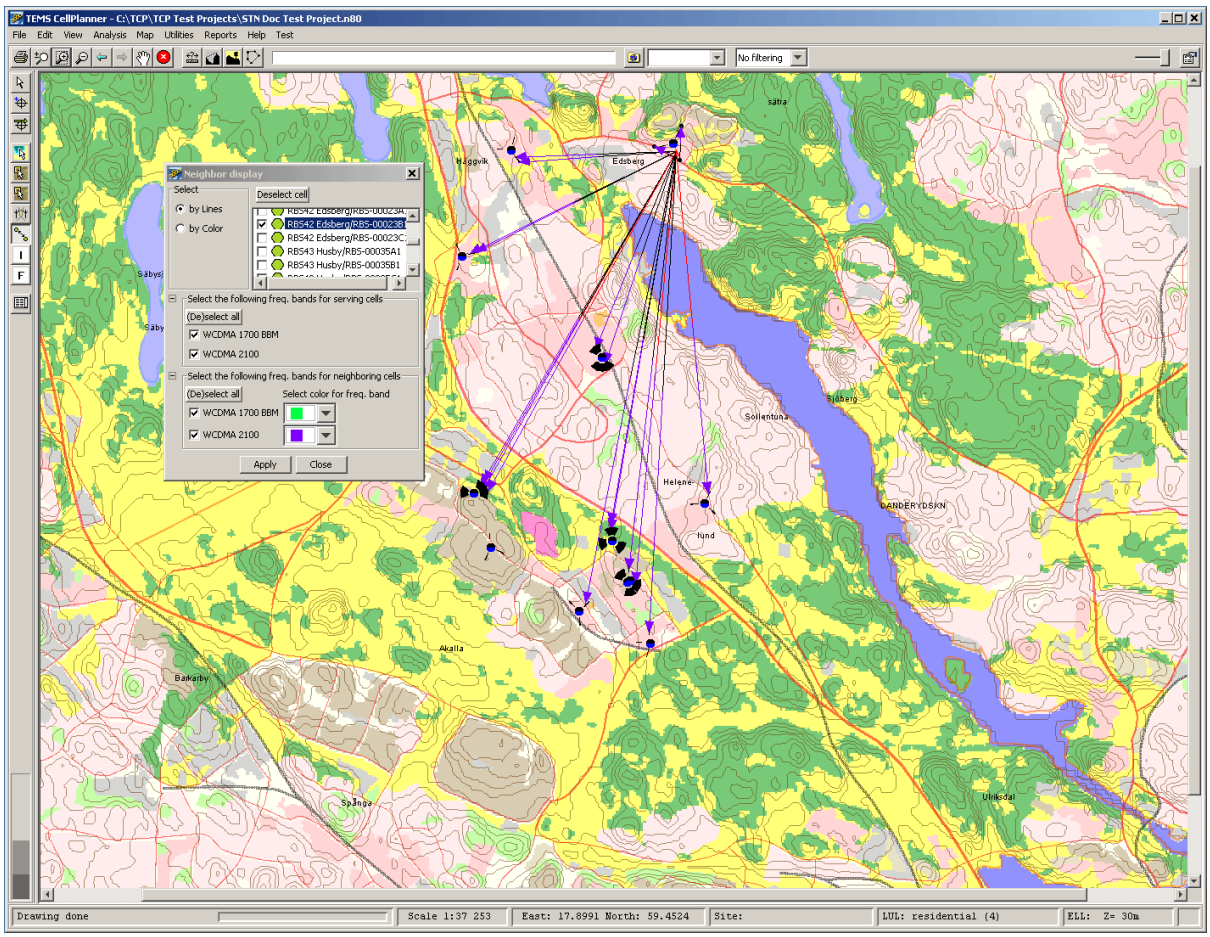
Fields on the Window

The following table describes the fields on the window:

Field	Description
Display by lines	Map display window shows neighbor relations by lines connecting cells/sectors.
Display by color	Map display window shows neighbor relations by colors showing neighbor relations.
Frequency bands for serving cells	Frequency bands of the serving cells to display.
Frequency bands for neighboring cells	Frequency bands of the neighboring cells to display.

Example of Neighbor Display

The following illustration of Neighbor display by lines for multi RBSes per site shows neighbor cells are here represented by sub-sections with one color for each frequency band.



11 Optimizing Scrambling Codes

This chapter describes how to optimize scrambling codes for WCDMA networks.

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Introduction to Optimizing Scrambling Codes

In WCDMA networks, cells are identified by:

- Unique cell ID
- Frequency
- Scrambling code

Cost in Scrambling Code Optimization

Optimizing scrambling codes analyzes the cost function and an optimization function to allow maximum code re-use in the network under different constraints. The cost function for the scrambling code algorithm in TEMS CellPlanner considers the following parameters:

- Minimum requirement on S/I between different cells with the same scrambling code
- Minimum requirement for Ec/Io for cells with the same scrambling code
- Constraints in scrambling code allocation resulting from the neighbor list of the deployed network
- Constraints in code group allocation schemes for cells at the same site

Prerequisites

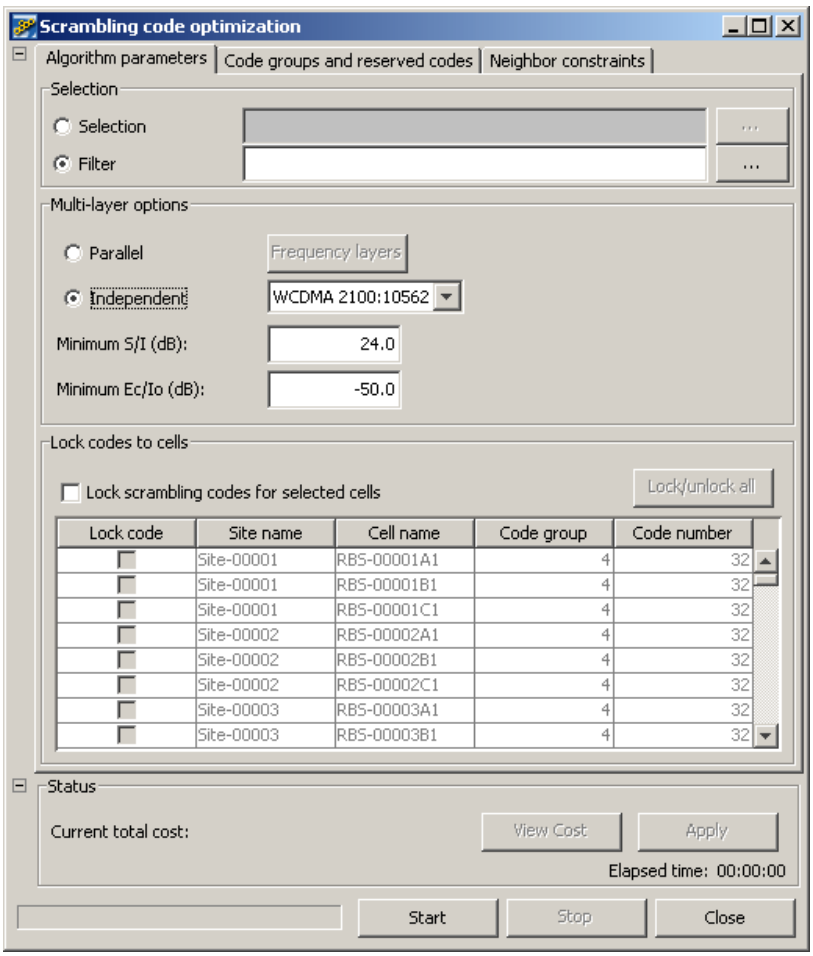
If you want to use neighbor constraints in optimizing scrambling codes, you need to generate neighbor lists first. See Planning Neighbor Lists, 10-1 for details.

Set Scrambling Code Optimization Algorithm Parameters

Scrambling code optimization algorithm parameters are used to indicate the type of optimization to run: parallel or independent optimization, and minimum threshold values for processing.

Window to Use

Use the **Scrambling code group optimization - Algorithm parameters** window to set basic optimization options:



Fields on the Window

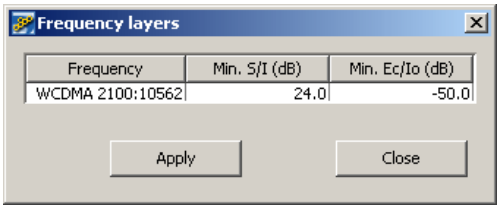
The following table describes the fields on the window:

Field	Description
Parallel	Optimizes scrambling codes in parallel for all frequency layers. Enables the **Frequency layer** button so you can optimize scrambling codes for frequency layers you specify. For parallel optimization, you must specify the frequency layers in the window displayed when you click **Frequency layer**.
Independent	Optimizes scrambling codes separately for each frequency layer, and allows you to select the layer.
Minimum S/I (dB)	The minimum required signal-to-interference ratio between the RSCP of the target cell (S) and the RSCP of any other cell on the same frequency layer for code re-use. Min. 0dB, max. 50 dB, initial value 24 dB A distant cell with the same scrambling code allocation as the cell under consideration will create co-channel interference for a mobile terminal under certain conditions. The mobile terminal may be able to detect the same scrambling code from two different cells, which will lead to a pilot conflict with strong interference. The cost function for minimum S/I monitors the ratio of the RSCP from the own cell to the RSCP from other cells to define, whether or not a certain scrambling code can be re-used for the cell. The initial setting for this parameter is 24 dB, which implies that the same scrambling code can be re-used if all other cells are received in the best server coverage area of the cell under consideration with an RSCP of at least 24 dB below the own cell RSCP.
Minimum Ec/Io (dB)	The minimum required Ec/Io of any other cell than the cell in question on the same frequency layer for code re-use. Min. -70dB, max. -20 dB, initial value -50 dB Most mobile terminals have a pilot detection threshold in the range of -18 to -20 dB for Ec/Io pilot channel quality. A mobile terminal in the coverage area of its serving cell cannot detect a pilot signal from a distant cell that is using the same scrambling code as the serving cell if the Ec/Io of the distant cell is substantially below the pilot detection threshold. In such case the distant cell and the serving cell can use the same scrambling code. A distant cell received with a pilot quality far below the pilot detection threshold can still cause substantial interference in the serving cell. For that reason the cost function for the scrambling code optimization algorithm also includes the minimum S/I requirement.

Field	Description
Lock scrambling codes for selected cells	Locks specific scrambling codes for selected cells. You can lock codes to cells by selecting individual cells, or by clicking **Lock/unlock all**. You can lock codes for selected site/cell names. Existing scrambling code groups and code numbers are displayed.
View cost	Displays the cost of scrambling code optimization. Available only when a cost value is generated during optimization.

Select Frequency Layers

The **Frequency layers** window lets you specify the frequency layers for scrambling code optimization as well as the parameter settings for Min. S/I and Min. Ec/Io per frequency layer.



Set Code Groups and Reserved Codes

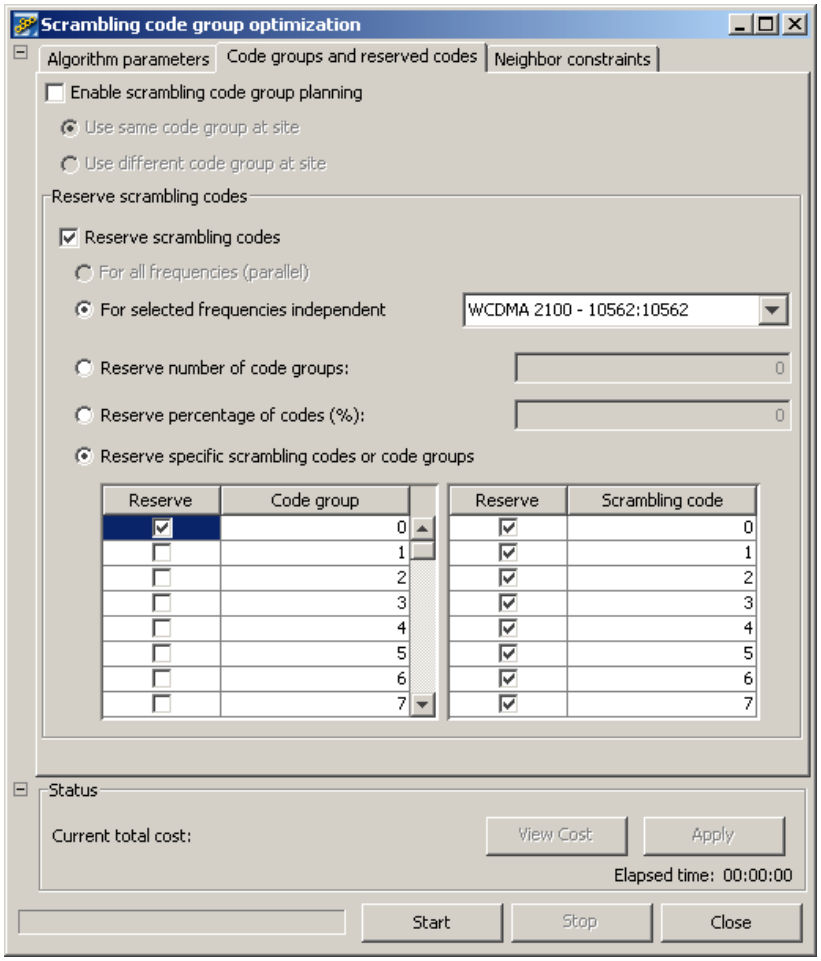
Scrambling Codes and Code Groups

The 512 scrambling codes are grouped in 64 groups of 8 codes in each group. You can assign or reserve individual codes as well as code groups.

You can allocate codes from the same scrambling code group or from different code groups. Reserving some scrambling codes for future use is recommended to allow for expansion and tuning of the network.

Window to Use

Use the Scrambling code group optimization - Code groups and reserved codes window to set codes and code groups:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Enable scrambling code group planning	• Use same code group at site - Uses the same code group for all cells in a site. • Use different code group at site - Uses a different code group for each sector in a site.
Reserve scrambling codes	Reserves a percentage or certain selected scrambling codes or code groups for later use. Using this option, the code optimization omits some of the scrambling codes from available code space.
For all frequencies (parallel)	Applies scrambling code or code group reservation to all enabled WCDMA frequency layers in the same manner.
For selected frequencies independent	Applies scrambling code or code group reservation to a selected frequency layer. The selection of codes or percentage of codes (or code groups) is applied only to the specified frequency layer displayed. This allows specifying scrambling code reservations for different WCDMA frequency layers.
Reserve number of code groups	Reserves code groups for later use. The omitted code groups are taken from the end of the code group list (starting from code group 63) until the required percentage is reached. Locked code groups are disregarded with this option. Locked codes are retained as allocated to cells they are locked to, and are omitted during code allocation to other cells in the network. Locked codes are not re-used by the code allocation algorithm.
Reserve percentage of codes	Reserves a specific percentage of codes for later use. The codes omitted are taken from the end of the code list (starting from code 511) until the required percentage is reached. Locked codes are disregarded with this option. Locked codes are retained as allocated to cells they are locked to, and are omitted during code allocation to other cells in the network. Locked codes are not re-used by the code allocation algorithm.
Reserve specific scrambling codes or code groups	Reserves a specific set of codes groups or single codes. Reserving specific scrambling codes or code groups applies to the selected frequency layer or to all frequency layers if parallel optimization is selected.

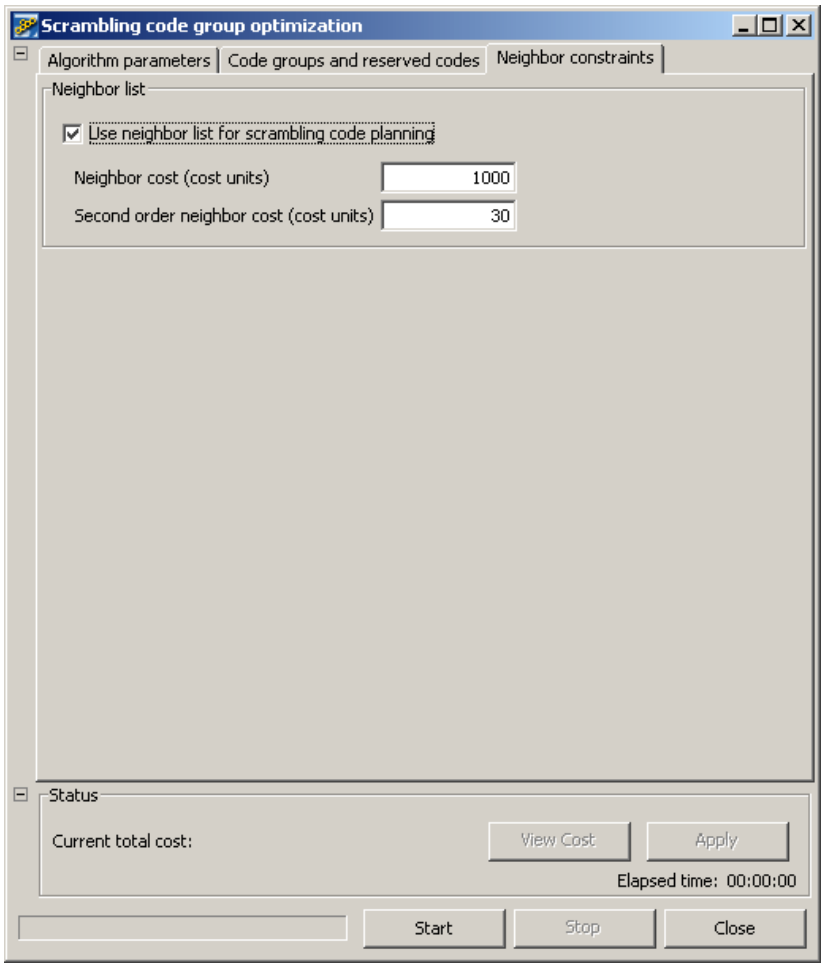
Set Neighbor Constraints

Scrambling code optimization allows you to control the use of neighbor list information and constraints during scrambling code optimization to avoid pilot conflicts in soft and softer handover areas of a network.

Neighboring cells must not use the same scrambling code as this results directly in a pilot conflict. The TEMS CellPlanner scrambling code allocation algorithm considers results from the neighbor list when allocating scrambling codes. During optimization, the goal is to arrive at a scrambling code allocation with a cost of zero, avoiding allocation of the same code to neighboring cells.

Window to Use

Use the Scrambling code group optimization - Neighbor constraints window to set neighbor list options:



Fields on the Window

The following table describes the fields on the window:

Field	Description
Use neighbor list for scrambling code planning	Uses or disregards neighbor list information for scrambling code optimization. When a mobile terminal is in soft and/or softer handover, the maximum length of the neighbor list (intra-system neighbors) in the mobile terminal is limited to 32 entries. The neighbor lists of all cells involved in the soft and/or softer handover connection are merged to one list. None of the neighboring cells for all cells participating in the handover connection should be assigned the same scrambling code.
Neighbor cost (cost units)	Specifies the cost for violating the constraints for direct neighbors.
Second order neighbor cost (cost units)	Specifies the cost for violating the constraint for second order neighbors (the neighbor's neighbor). Set the cost to 0 (zero) to have the calculations ignore second order neighbors.

Optimize Scrambling Codes

Use this procedure to optimize scrambling codes after selecting options for the optimization process.

Procedure

Follow these steps to optimize scrambling code allocation:

1. Select Analysis↗WCDMA↗Optimize scrambling codes. The Scrambling code optimization window is displayed.
2. Select the options required for the scrambling code algorithm, codes and code groups, and neighbor constraints.
3. Click Start. The scrambling code optimization process starts, and progress messages are displayed in the Status area of the window.

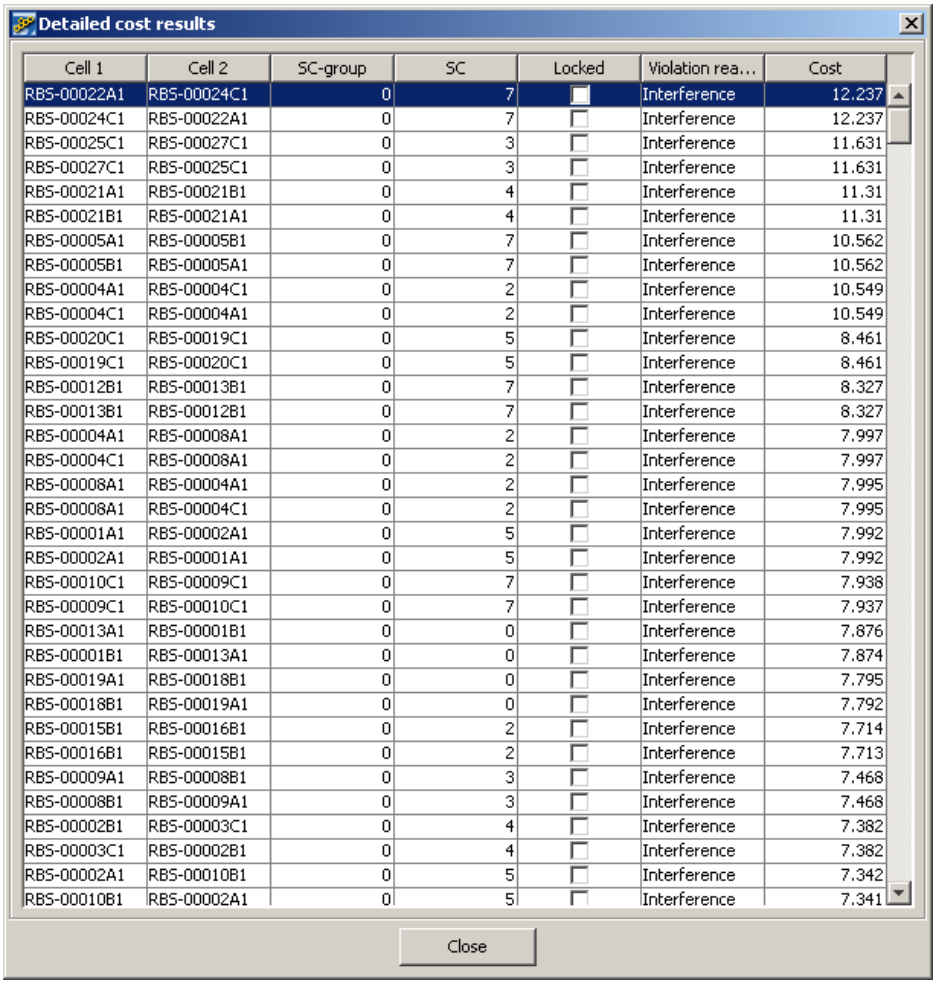
   If optimization produces costs, click View cost to display the list of cost items found during optimization.
4. When you are satisfied with the optimization results, click Apply to apply the optimization results to individual cells in the network plan.

View Cost of Scrambling Code Optimization

Use this procedure to view details on the cost of the optimized scrambling codes. This option is available only when there is a cost involved in the scrambling code optimization.

Window to Use

Use the **Detailed cost results** window to view the cost of scrambling code optimization. It provides a detailed overview of the cells that re-use the same scrambling code, violating any of the set constraints for interference, first, or second order neighbors.



Cell 1	Cell 2	SC-group	SC	Locked	Violation rea...	Cost
RBS-00022A1	RBS-00024C1	0	7		Interference	12.237
RBS-00024C1	RBS-00022A1	0	7		Interference	12.237
RBS-00025C1	RBS-00027C1	0	3		Interference	11.631
RBS-00027C1	RBS-00025C1	0	3		Interference	11.631
RBS-00021A1	RBS-00021B1	0	4		Interference	11.31
RBS-00021B1	RBS-00021A1	0	4		Interference	11.31
RBS-00005A1	RBS-00005B1	0	7		Interference	10.562
RBS-00005B1	RBS-00005A1	0	7		Interference	10.562
RBS-00004A1	RBS-00004C1	0	2		Interference	10.549
RBS-00004C1	RBS-00004A1	0	2		Interference	10.549
RBS-00020C1	RBS-00019C1	0	5		Interference	8.461
RBS-00019C1	RBS-00020C1	0	5		Interference	8.461
RBS-00012B1	RBS-00013B1	0	7		Interference	8.327
RBS-00013B1	RBS-00012B1	0	7		Interference	8.327
RBS-00004A1	RBS-00008A1	0	2		Interference	7.997
RBS-00004C1	RBS-00008A1	0	2		Interference	7.997
RBS-00008A1	RBS-00004A1	0	2		Interference	7.995
RBS-00008A1	RBS-00004C1	0	2		Interference	7.995
RBS-00001A1	RBS-00002A1	0	5		Interference	7.992
RBS-00002A1	RBS-00001A1	0	5		Interference	7.992
RBS-00010C1	RBS-00009C1	0	7		Interference	7.938
RBS-00009C1	RBS-00010C1	0	7		Interference	7.937
RBS-00013A1	RBS-00001B1	0	0		Interference	7.876
RBS-00001B1	RBS-00013A1	0	0		Interference	7.874
RBS-00019A1	RBS-00018B1	0	0		Interference	7.795
RBS-00018B1	RBS-00019A1	0	0		Interference	7.792
RBS-00015B1	RBS-00016B1	0	2		Interference	7.714
RBS-00016B1	RBS-00015B1	0	2		Interference	7.713
RBS-00009A1	RBS-00008B1	0	3		Interference	7.468
RBS-00008B1	RBS-00009A1	0	3		Interference	7.468
RBS-00002B1	RBS-00003C1	0	4		Interference	7.382
RBS-00003C1	RBS-00002B1	0	4		Interference	7.382
RBS-00002A1	RBS-00010B1	0	5		Interference	7.342
RBS-00010B1	RBS-00002A1	0	5		Interference	7.341

You can sort any of the rows in the table in ascending or descending order. For example, you can view scrambling code allocations that violate the neighbor constraints, or for which the cost of the violation is highest (worst cases).

Field	Description
Cell 1	The first cell in a pair of cells assigned the same scrambling code, leading to a violation of any of the constraints.
Cell 2	The second cell in a pair of cells assigned the same scrambling code, leading to a violation of any of the constraints.
SC Group	The scrambling code group of the scrambling code number that caused a violation of the code allocation constraints.
SC	The scrambling code number that caused a violation of the code allocation constraints.
Violation reason	The code allocation constraints violated during optimization. Possible values include: • Interference • Direct neighbor • Second order neighbor

12
Optimizing Pilot Power

This chapter describes how to optimize pilot power for WCDMA networks.

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Optimize Pilot Power 12-2

Optimize Pilot Power

Use this procedure to automatically calculate the power settings for the Common Pilot Channel (CPICH) for selected cells and report those cells with low power pilots.

Prerequisites

Run WCDMA Monte Carlo analysis once to produce CPICH coverage plots (Ec/Io margin) and a best server coverage plot for the WCDMA bearer you would like to use as a reference for pilot power optimization.

WCDMA Analysis Plots and Power Optimization

It is strongly recommended to optimize pilot power once and then check the new CPICH and WCDMA bearer coverage by re-running WCDMA analysis.

Ensure that you re-run WCDMA analysis after optimizing pilot power to get updated plots for CPICH and WCDMA bearer coverage. The plots are an important base for the optimization algorithm.

The new power value calculated for the CPICH in each cell is calculated from:

> New CPICH power = Old CPICH power - (achieved Ec/Io at service coverage edge - wanted minimum Ec/Io for power optimization)

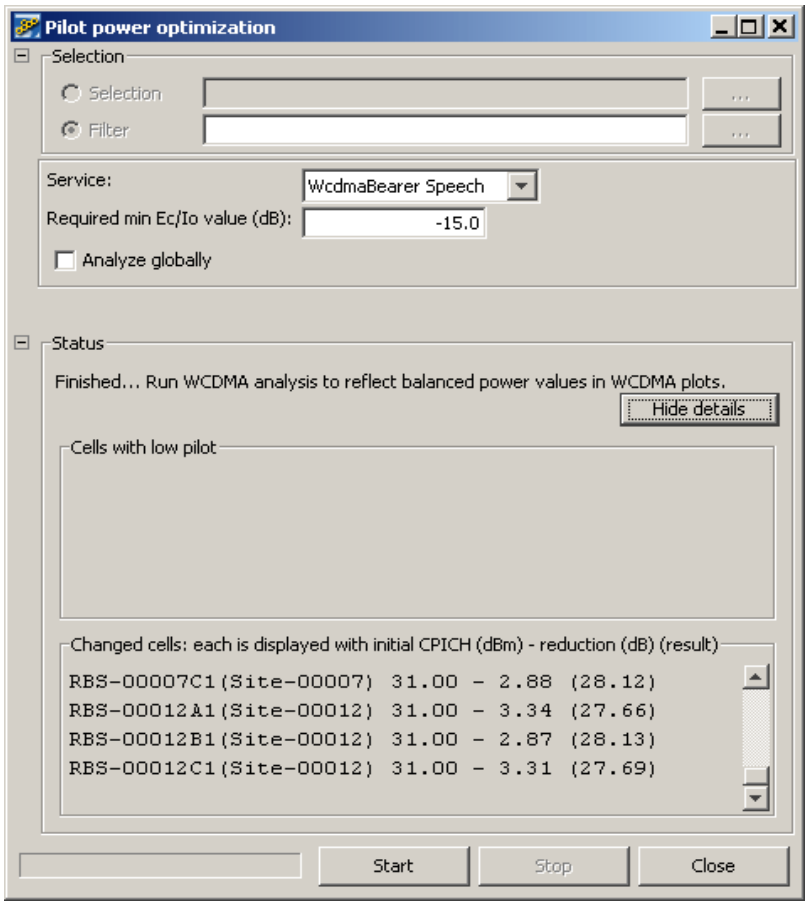
The CPICH power value in the cell parameters is changed every time you optimize pilot power.

WCDMA Analysis Parameters Affecting Ec/Io Plots

The downlink CPICH quality threshold used in some of the CPICH plots is calculated from WCDMA analysis algorithm parameter **Min. DL Ec/Io for CPICH (dB)**.

Window to Use

Use the Pilot power optimization window to balance pilot channel power:



Fields on the Window

The table below describes the fields on the window:

Field	Description
Service	The WCDMA bearer to use as the reference for optimizing pilot power. The bearer should have the largest coverage area in the network plan used in the most recent run of WCDMA analysis.
Wanted min Ec/Io value (dB)	Specifies the Ec/Io quality that should be available at the cell service coverage edge after optimizing pilot power. Initial value is minimum downlink Ec/Io + handover threshold. Example: -18dB + 3dB = -15dB.

Field	Description
Analyze Globally	When selected, the algorithm uses the minimum difference between CPICH coverage and WCDMA bearer coverage for the cell with the weakest CPICH coverage in the network as a basis for optimizing pilot power. Leave the option unselected to run power optimization for individual cells. In this case, the algorithm uses the minimum difference between CPICH coverage and WCDMA bearer coverage for each individual cell as a basis for power optimization.
Status	Displays the status of power optimization. Show details - shows the cells found with low pilot power.

Procedure

Follow these steps to optimize pilot power:

1. Select **Analysis↗WCDMA↗Optimize pilot power.** The **Pilot power optimization** window appears.
2. Add or change information as required.
3. Click **Start**. The power optimization calculations begin and the results of the process are displayed in the **Status** area.
4. Once power optimization has completed, the new power values for CPICH are entered in the Power field of the respective cells. You can check new power values under Utilities↗ WCDMA RBS explorer↗Cell↗Common channels.

To reflect the changes in the power settings in the CPICH and WCDMA bearer coverage plots you must re-run WCDMA analysis with the new power settings.

13
Planning for Mobile Positioning Data

This chapter describes support for planning and maintaining mobile positioning data.

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Assign Cells to Location, Routing and Service Areas 13-3
Display Area Configurations 13-4
Generate Cell Polygons 13-5
Visualize Cell Polygons 13-7
Edit Cell Polygons 13-8
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Select Maximum Number of Polygon Vertices 13-12
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Introduction to Mobile Positioning

Location Area

A *location area* consists of a number of cells and is used by a WCDMA network to page terminals in all cells in the location area on request from the circuit switched core network.

Service Area

A *service area* consists of a number of cells. It is used by the WCDMA network to indicate the location of the terminal to the core network. It is also used by the core network to indicate the area to which core network information should be broadcast.

Routing Area

A r*outing area* consists of a number of cells. It is used by the WCDMA network to page mobile terminals on request from the packet switched core network.

Area Interdependencies

When defining location area, service area, and routing area, the following limitations must be considered:

- Each cell must refer to a location area, a routing area, and a service area.
- Cells belonging to the same routing area or service area must belong to one and the same location area. A routing area or service area cannot consist of cells belonging to different location areas.
- A service area may consist of cells belonging to different routing areas.
- Cells within a location area, routing area, or service area can belong to different RNCs.
- One and the same location area, routing area, and service area may be configured in one or more RNCs. This is because the core network must be able to page a mobile terminal in more than one RNC if required.

To define location, routing, and service areas for WCDMA subnetworks, see Add Location Areas to Subnetworks, 3-92, Add Routing Areas to Subnetworks, 3-94, and Add Service Areas to Subnetworks, 3-96.

See also further information in *TEMS CellPlanner WCDMA Technical Reference Manual*, the chapter "Concepts".

Assign Cells to Location, Routing and Service Areas

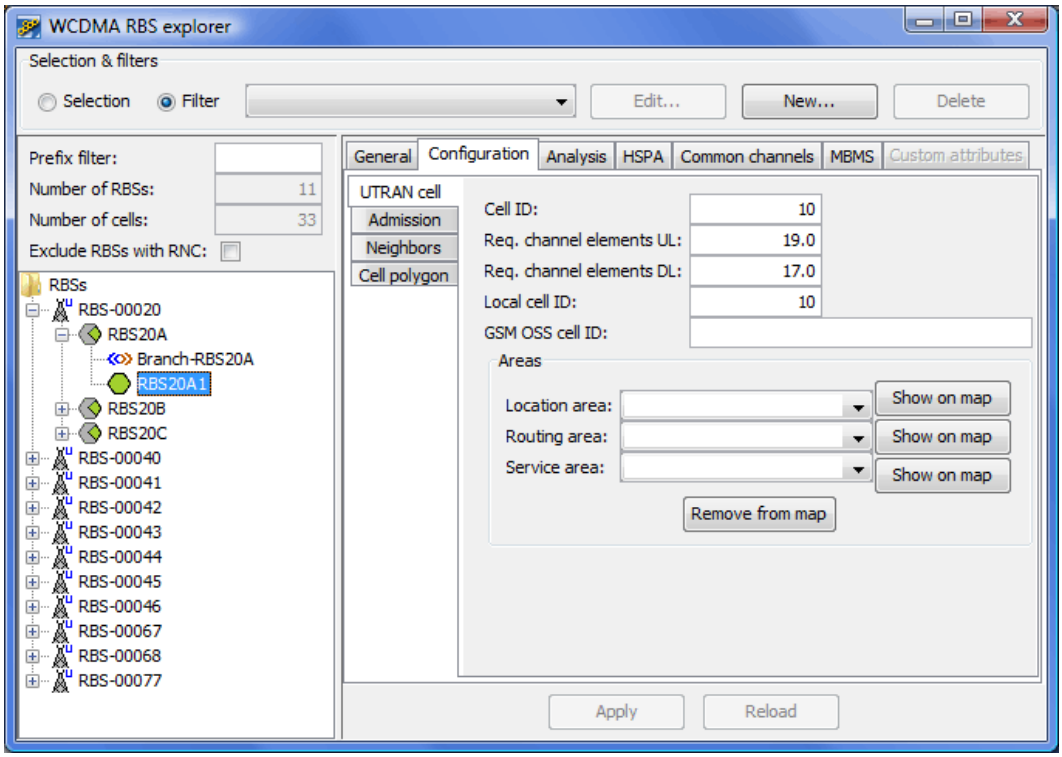
Use this procedure to assign cells in a WCDMA network plan to location, routing, and service areas.

Assign Multiple Cells to Area Configuration

If you want to assign multiple cells to the same area configuration, select these cells and select the location area, routing area and service area assignment for all these cells at once.

Window to Use

Use **UTRAN cell - Configuration - UTRAN cell** window to assign cells to the areas you have defined previously:



Procedure

Follow these steps to assign cells to areas:

1. Select **Utilities↗WCDMA RBS explorer**.
2. Expand the RBS tree, highlight the desired cell, and select the **UTRAN cell - Configuration** tab.
3. Click **Apply** to store the changes to the project.

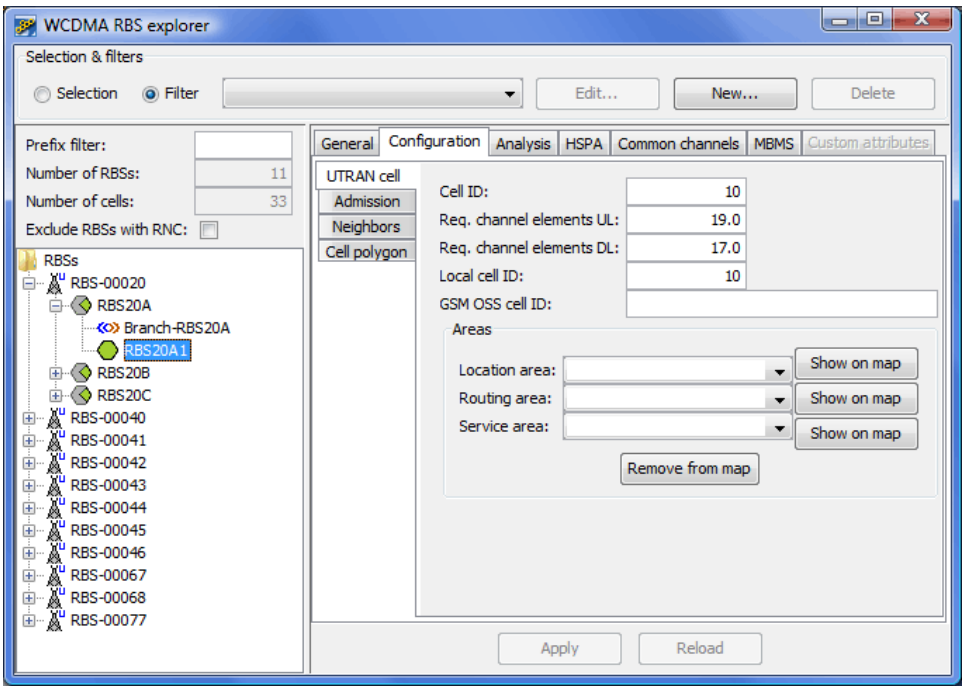
Display Area Configurations

Use this procedure to display area configurations assigned to cells in the WCDMA network plan.

When you display several area configurations on the same map display, each is shown in a different color. You can change the color and transparency of the area display layer in the **Edit legend properties** window, accessible by right-clicking on the legend header of the map layer.

Window to Use

Use **UTRAN cell - Configuration - UTRAN cell** window to display area configurations:



Procedure

Follow these steps to display area configurations:

1. Select **Utilities↗WCDMA RBS explorer**.
2. Expand the RBS tree, highlight the desired cell, and select the **UTRAN cell - Configuration** tab.
3. Select Area Configuration to be displayed and click **Show on Map**. The selected area configuration is displayed on the map with a specific color code for each area selected. The shape and size of the areas to be displayed depends on WCDMA bearer independent best server information.
4. To remove the area display from the map again click **Remove from Map**.

Generate Cell Polygons

Use this procedure to generate cell polygons for coverage planning.

Generated cell polygons are based on the best server coverage area for each cell. The size and shape of cell polygons in border areas might not reflect the optimum plan, so it is recommended to run WCDMA analysis for a selected region only.

You can change the position of the vertices (corner points) of generated polygons. See Edit Cell Polygons on page 13-8.

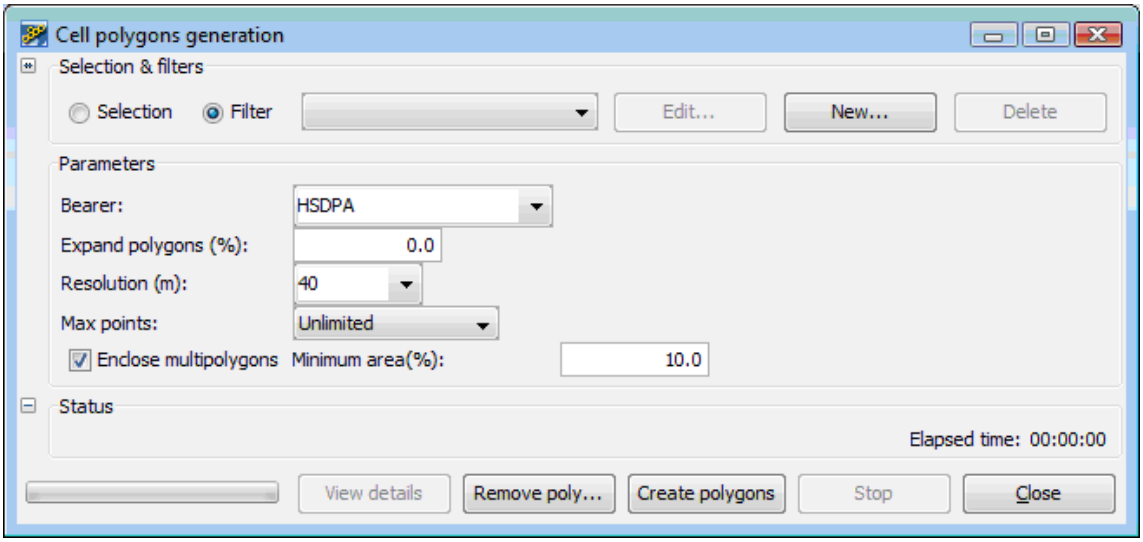
Prerequisites

Best server results from WCDMA Analysis are available.

Procedure

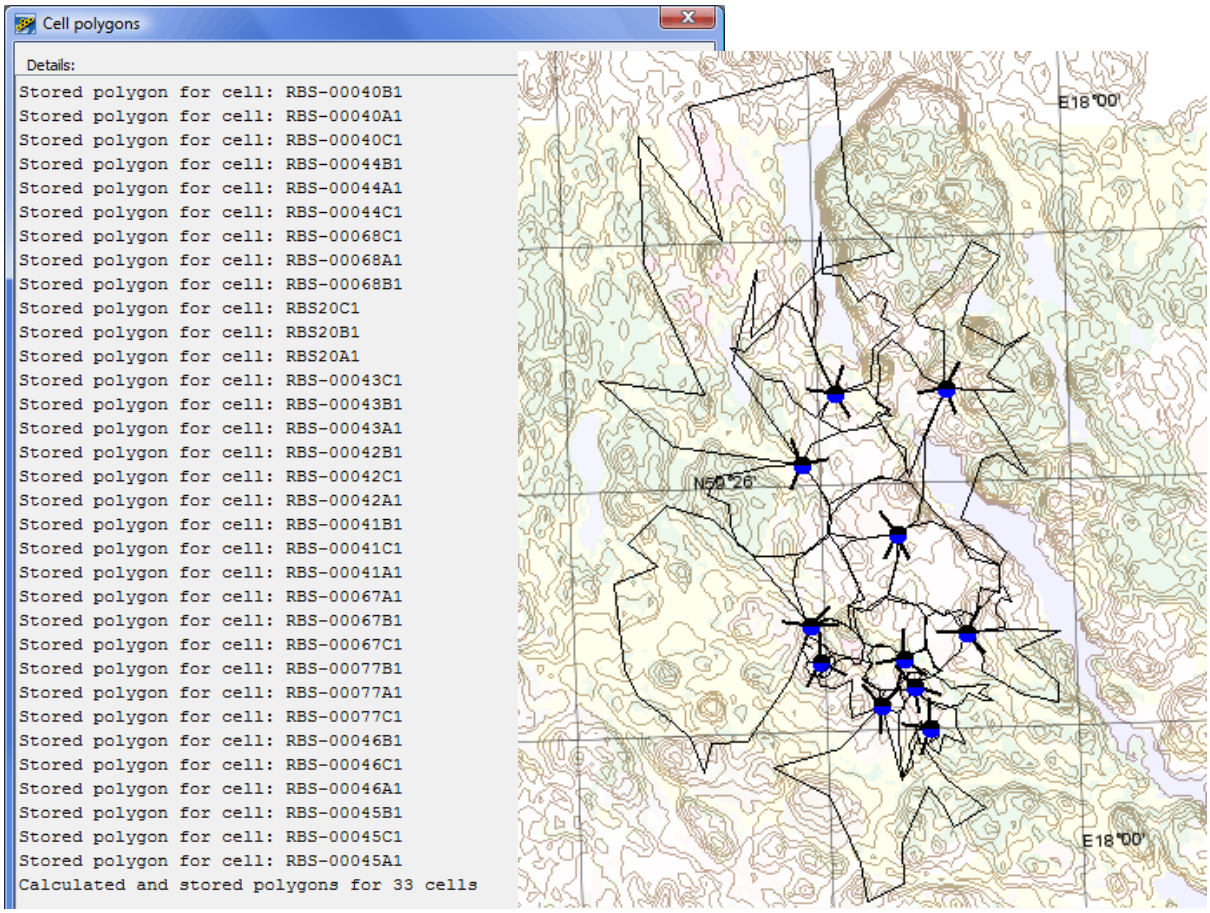
Follow these steps to generate cell polygons:

1. Select **Analysis↗WCDMA↗Cell polygons↗Generate**. The **Cell polygons generation** window is displayed:



2. Set the parameters as desired and click **Create polygons**. The generated polygons are displayed in the map window, see example below.

3. Optionally click **View details** in the **Cell polygons generation** window to see details about the generated cell polygons as in the following example:



Fields on Window "Cell polygons generation"

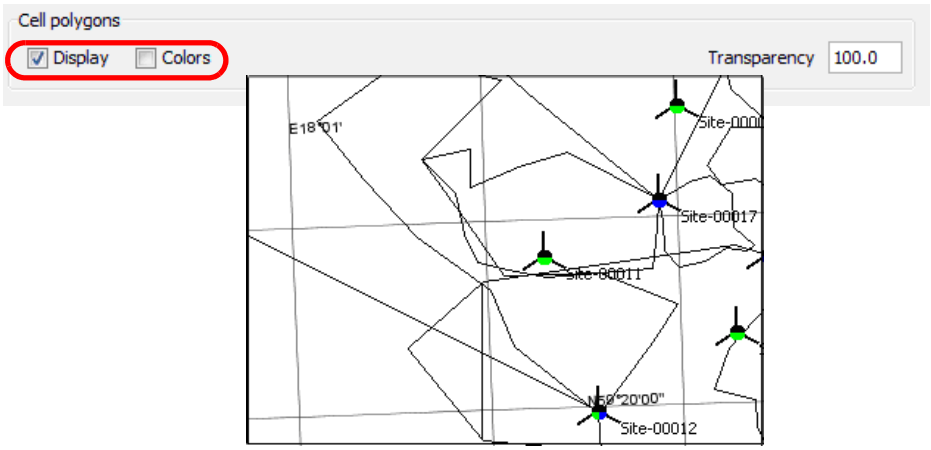
Field	Description
Bearer	Select bearer
Expand polygons (%)	Expand polygons relative its original size. The generated polygon will be expanded by adding a buffer zone.
Resolution (m)	Resolution for the best server raster used to alter polygon generation performance. A smaller value may give more accurate result but take a longer time.
Max points	Select maximum number of polygon vertices (points).
Enclose multipolygons	If multipolygons for one cell are created, use convex envelopes to cover all polygons. The multipolygons are concatenated to one single polygon.
Minimum area (%)	Cell polygons smaller than this area in relation to an envelope area are enclosed in a convex envelope polygon. Used if **Enclose multipolygons** is selected.
View details	Displays text details about the cell polygons.
Remove polygons	Removes previously generated cell polygons.
Create polygons	Starts generation of cell polygons.

Visualize Cell Polygons

The cell polygons are displayed in the network layer on the map display when you set the **Display** option in the Cell polygons pane of the Network layer settings, see *Edit Network Layer Properties* in the *TEMS CellPlanner Common Features User's Guide*. The cell polygons are displayed as lines or filled with colors.

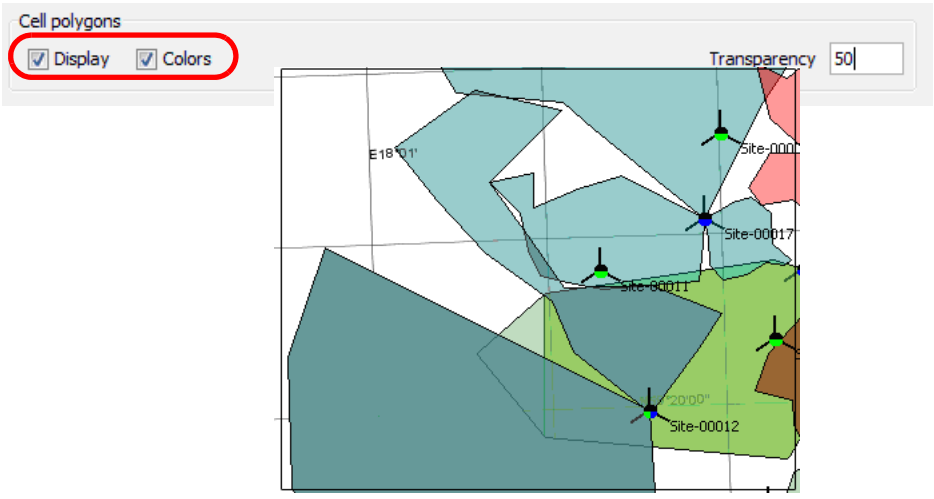
Cell Polygons Without Colors

To visualize cell polygons as pure lines, unselect the **Colors** option in the Network layer properties and select the **Display** option. The **Transparency** settings are irrelevant for this line-based view.



Cell Polygons With Colors

To fill cell polygons with randomly selected colors, select options **Colors** and **Display** in the Network layer properties, and set the desired **Transparency**, in this example 50%:



Edit Cell Polygons

There are two ways of changing the size and shape of cell polygons:

- Edit Cell Polygon via Cell Polygon Editor
- Edit Cell Polygon via Site Explorer

Edit Cell Polygon via Cell Polygon Editor

Use this procedure to change the size and shape of cell polygons from the **Cell polygon editor**.

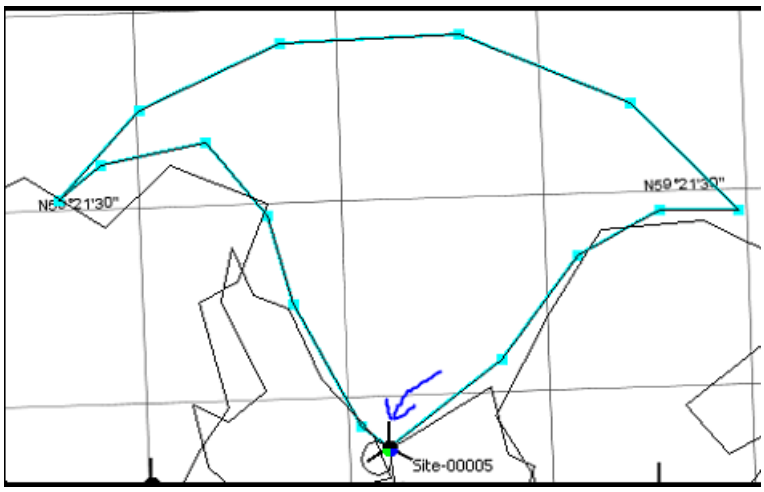
Prerequisites

Cell polygons are created, see Generate Cell Polygons on page 13-5.

Procedure

Follow these steps to generate cell polygons:

1. Select **Analysis↗WCDMA↗Cell polygons↗Edit**. The area editor cursor appears on the map display.
2. When selecting an antenna symbol of a cell in the map display, the associated cell polygon's contours and vertices are highlighted in color.



3. Place the cursor within the cell polygon and right-click. A menu with the following choices appear:
   - **Expand polygon**
   - **Select all** - select all vertices
   - **Deselect all** - deselect all vertices
   - **Undo** - undo the last (up to 100) modifications. Invoked also by CTRL-Z.

- **Redo** - redo the last (up to 100) modifications. Invoked also by CTRL-SHIFT-Z
- **Save** - save the modified polygon in the cell configuration

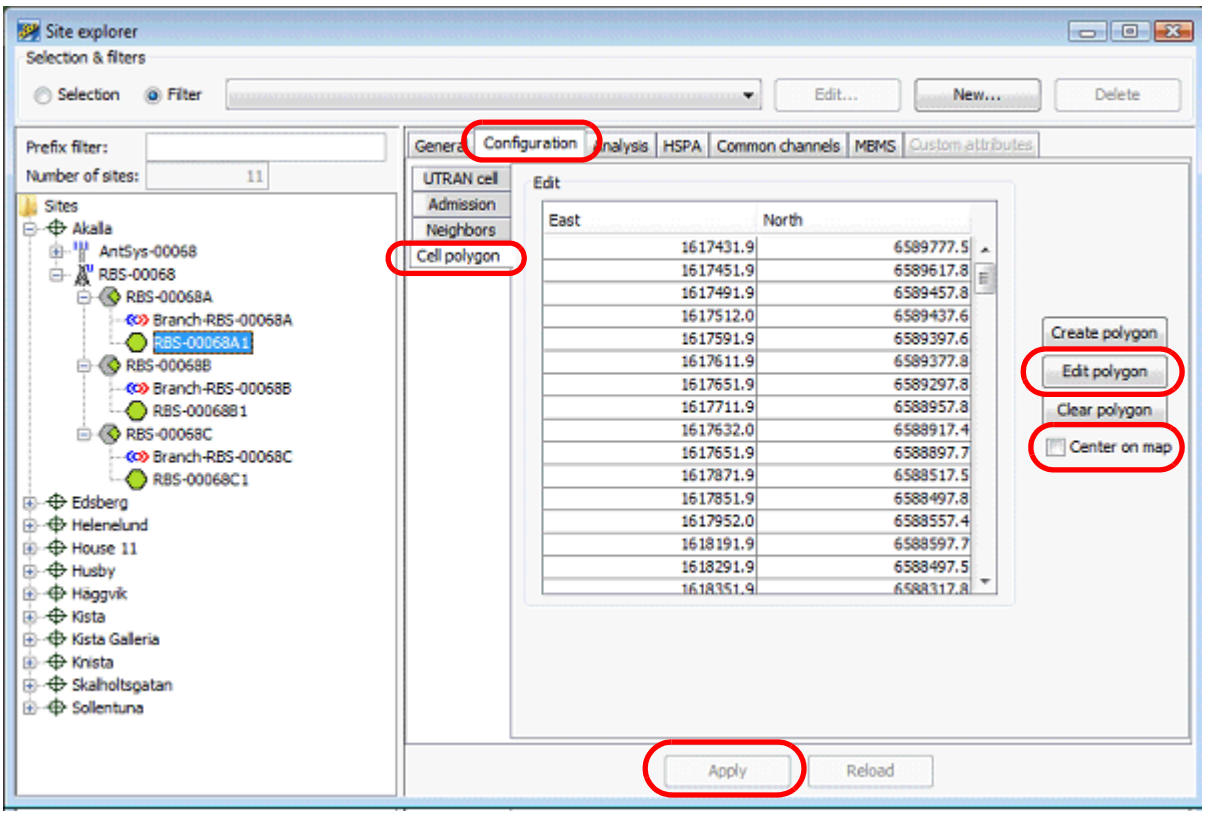
4. You can expand the cell polygon with a certain percentage, or select all and drag vertex by vertex to reshape the cell polygon. When you save the edited polygon, the original cell polygon is aligned with the edited cell polygon:

The editor also has the following functionality:

- Selection
  - Select a vertex by clicking its symbol, other vertices will be deselected
  - Select multiple vertices by holding the CTRL key down while clicking subsequent vertex symbols
  - By holding down the SHIFT key all vertices between a previously selected vertex and the new vertex will be selected, following the vertices in counter clockwise direction.
- When a vertex is selected and its neighbors are also selected, the vertex may be moved by dragging the mouse.
- When a vertex is selected, all vertices between this and the next selected vertex to the left and/or to the right will be moved along with this vertex, using a Helmert's transformation. This implies that if only one vertex is selected, the entire polygon will be transformed along with this vertex.
- Delete a vertex: Clicking the DEL key will cause all selected vertices to be marked as deleted.
- If the cell polygon edit is interrupted by the start of another map tool, for example a zoom tool, or the map view being modified, returning to the cell polygon editor will continue the edit in the same state where it was when being interrupted.

Edit Cell Polygon via Site Explorer

Use the **UTRAN cell configuration - Cell polygon** window to edit cell polygons:



You can change the coordinates of the vertices (corner points) of the polygon in the table, or from the map display.

To edit polygons from the map display, select **Center on map** and click **Edit polygons**. Center on map reformats the map display for ease of use when re-shaping the polygon.

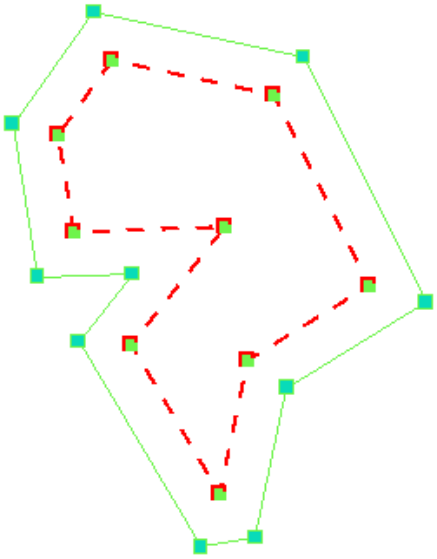
The vertices of the polygon for the selected cell are highlighted. Click and drag the vertices as desired. The vertex coordinates are simultaneously updated in the table. Click **Apply** to preserve the changes.

Expand Cell Polygon

This is a special case of Edit Cell Polygons.

When you select **Expand polygon** from the menu, the selected cell polygon(s) are expanded with a buffer zone corresponding to the percentage you enter.

The example below shows an expanded cell polygon:



Select Maximum Number of Polygon Vertices

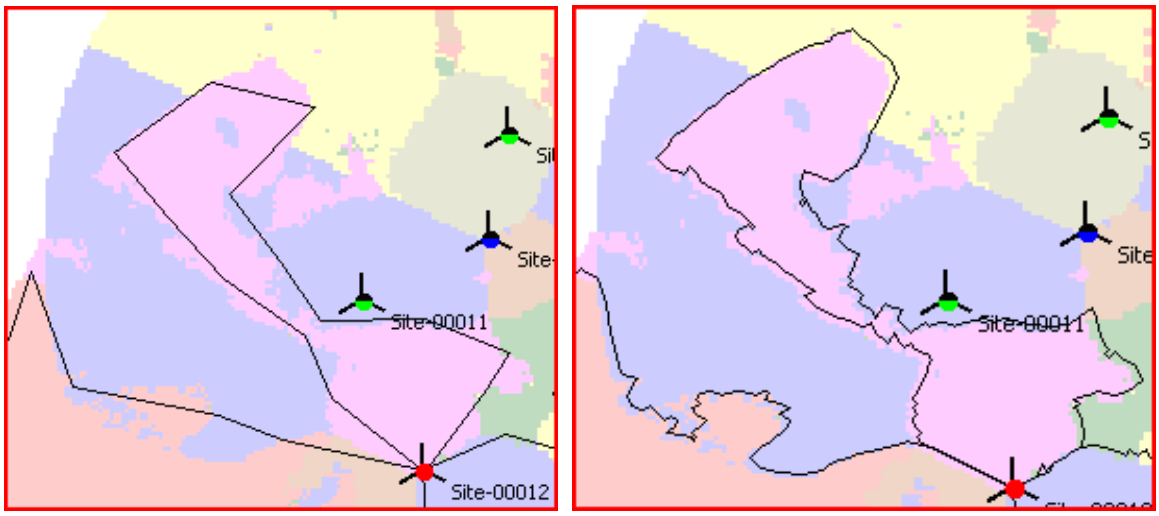
This is a special case of Generate Cell Polygons.

The cell polygons for selected cells, or all cells, are calculated with the number of vertices selected from a list in parameter **Max points**.

The available choices of **Max points** are as follows:

- 3GPP compliant (15)
- 50
- 200
- Unlimited

The example below shows the same cell polygon, first generated with 15 vertices (3GPP compliant), then with 100 vertices.

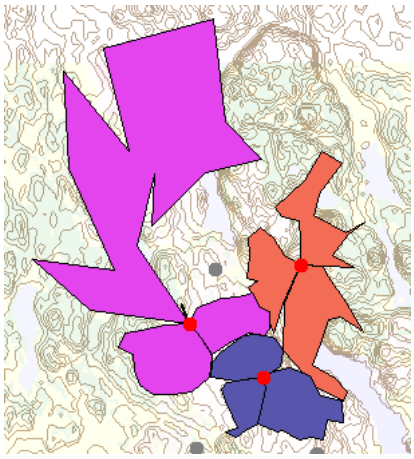


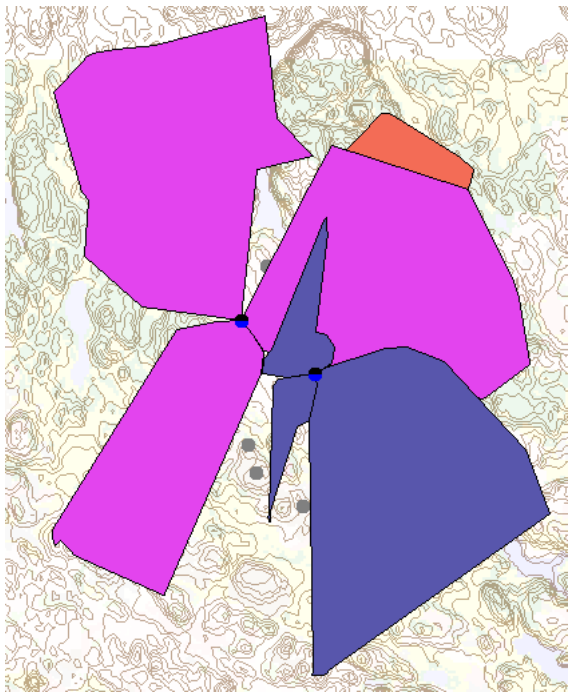
Create Convex Envelope for Multiple Cell Polygons

This is a special case of Generate Cell Polygons.

The cell polygon generation might result in multiple polygons. By selecting the **Enclose multi polygons** option and enter a **Minimum area**, the multiple polygons are replaced by one polygon covering all of the sub-polygons larger the minimum area.

The example below shows cell polygons generated without envelope to the left, and cell polygons generated with envelope to the right.





14
Working with WCDMA Plots

This chapter describes the plots generated by WCDMA analysis functions.

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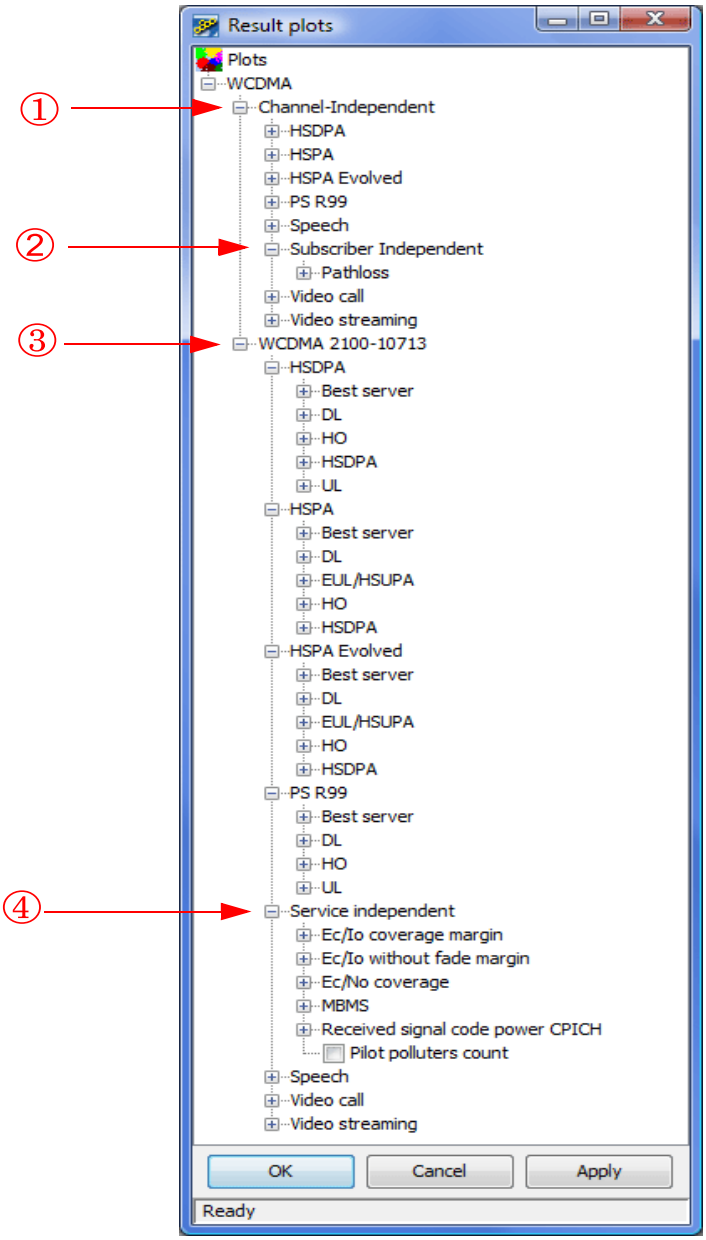
About WCDMA Plots

For generic information about plots, read chapter *Plots* in the *TEMS CellPlanner Common Features User's Guide.*

Note: *Some of the information in this chapter is obsolete due to not yet documented changes in plot handling in TEMS CellPlanner 9.0.*

The WCDMA result plots selection window opened from the icon or from **Analysis↗Result plots...** might look as in the following example:



The result from Calculate Composite Pathloss Matrix can be displayed as subscriber independent pathloss plots.

The result from WCDMA Analysis can be displayed as plots for best server coverage, uplink and downlink traffic channel coverage, HSPA, MBMS, and the handover situation in the network plan. The generated plots depend on the settings you have made for WCDMA analysis. The plots available are organized as in the previous picture, explained in the following table:

	Plot Category	Description
①	Channel independent	Independent of frequency. Calculated for all frequencies, per traffic demand mix.
②	Subscriber independent	Independent of both terminal type and bearer. Available plots: • Pathloss plots
③	WCDMA frequency	All predictions are created per service (bearer) and traffic demand mix. Traffic and interference vary with carriers. Coverage depends on terminal capabilities. Available plots: • Best server • DL (downlink) • EUL/HSUPA (if enabled) • HO (handover) • HSDPA (if enabled) • UL (uplink)
④	Service independent	Independent of services (bearers) and traffic demand mix. Available plots: • Ec/Io coverage margin • Ec/Io without fade margin • Ec/No coverage • MBMS (if enabled) • Received signal code power CPICH • Pilot polluters count

Optimizing pilot power generates additional plots showing Ec/Io and Ec/No coverage and pilot pollution.

In addition, WCDMA analysis generates several statistical reports and charts for evaluating the design of the WCDMA radio network. Statistics are available only after performing WCDMA analysis based on Monte Carlo simulations.

All statistics and charts are generated only for the user defined region in case this option has been selected when running WCDMA analysis.

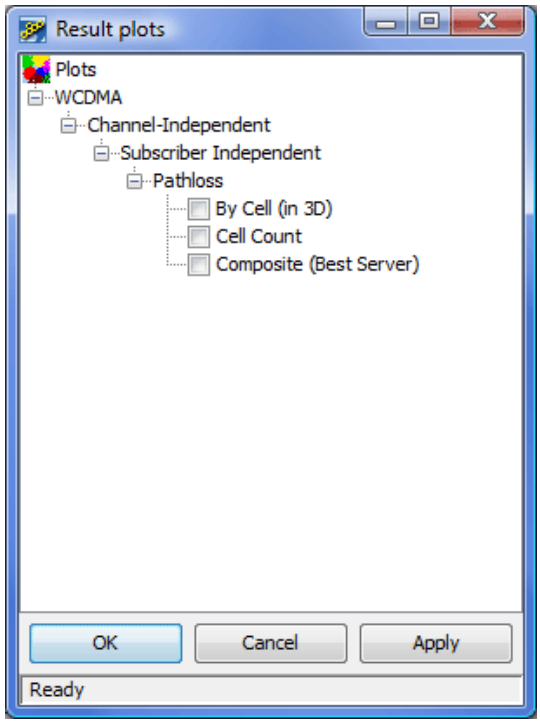
WCDMA Pathloss Plots

The result from Calculate Composite Pathloss Matrix (CPLM) is calculated for the frequency of the selected propagation model. The CPLM can be displayed as pathloss plots, color coded for every bin served by the best serving cell:

- Subscriber Independent Pathloss by Cell in 3D
- Subscriber Independent Pathloss Cell Count
- Subscriber Independent Pathloss - Composite Display

The plots are subscriber independent, that is, terminal types and services (bearers) are not taken into account.

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example including pathloss plots:



The subsequent pages describe and exemplify the pathloss plots.

Subscriber Independent Pathloss by Cell in 3D

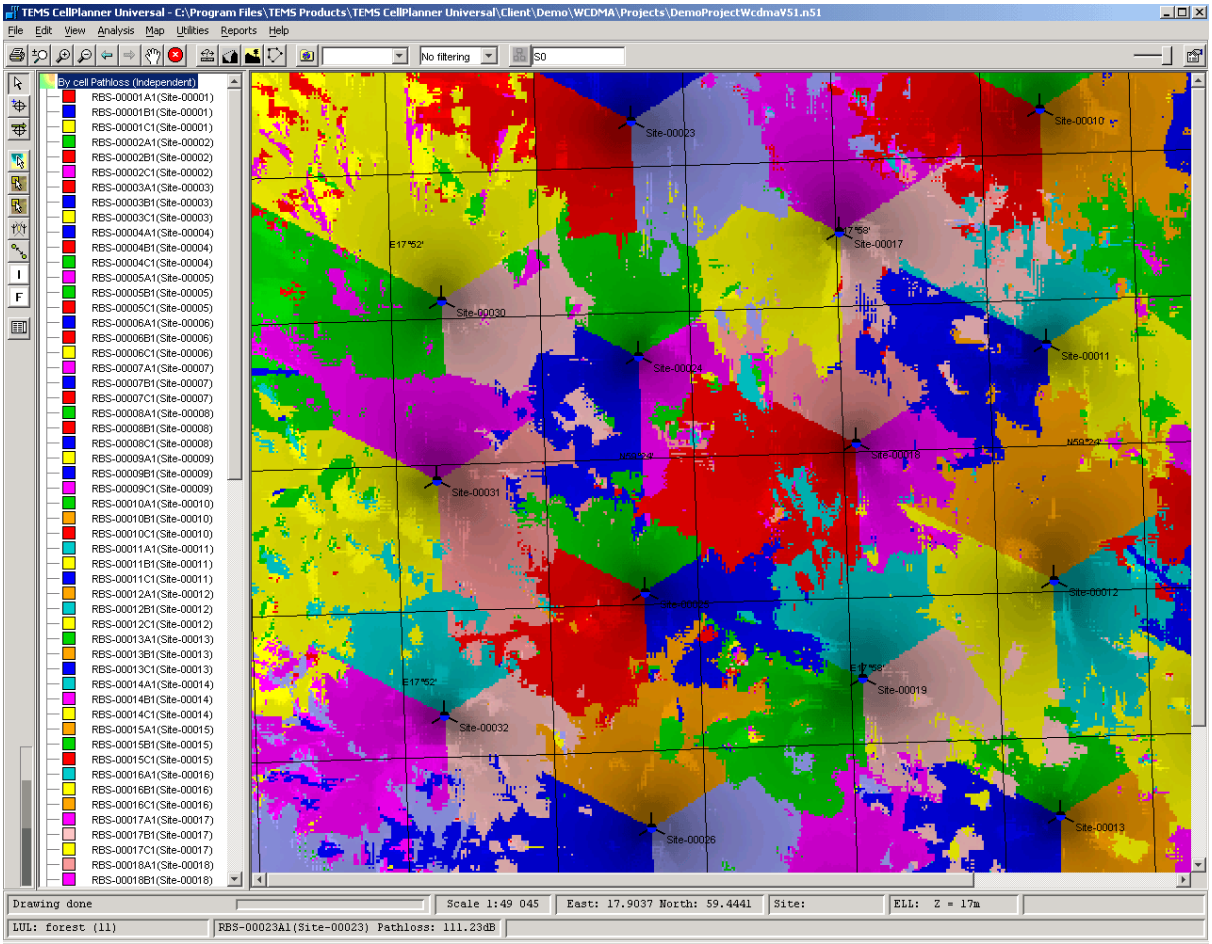
A 3D plot is three-dimensional because it displays the analysis parameters as well as the best serving cell in each bin.

The color of the display shows the best serving cell, while the pathloss value is shown by changing hue and saturation of the selected color.

The status bar indicates for each position in the network the best serving cell and a pathloss value from that cell to the selected position in dB.

Example Plot

The following example shows the subscriber Independent pathloss by cell in 3D plot:



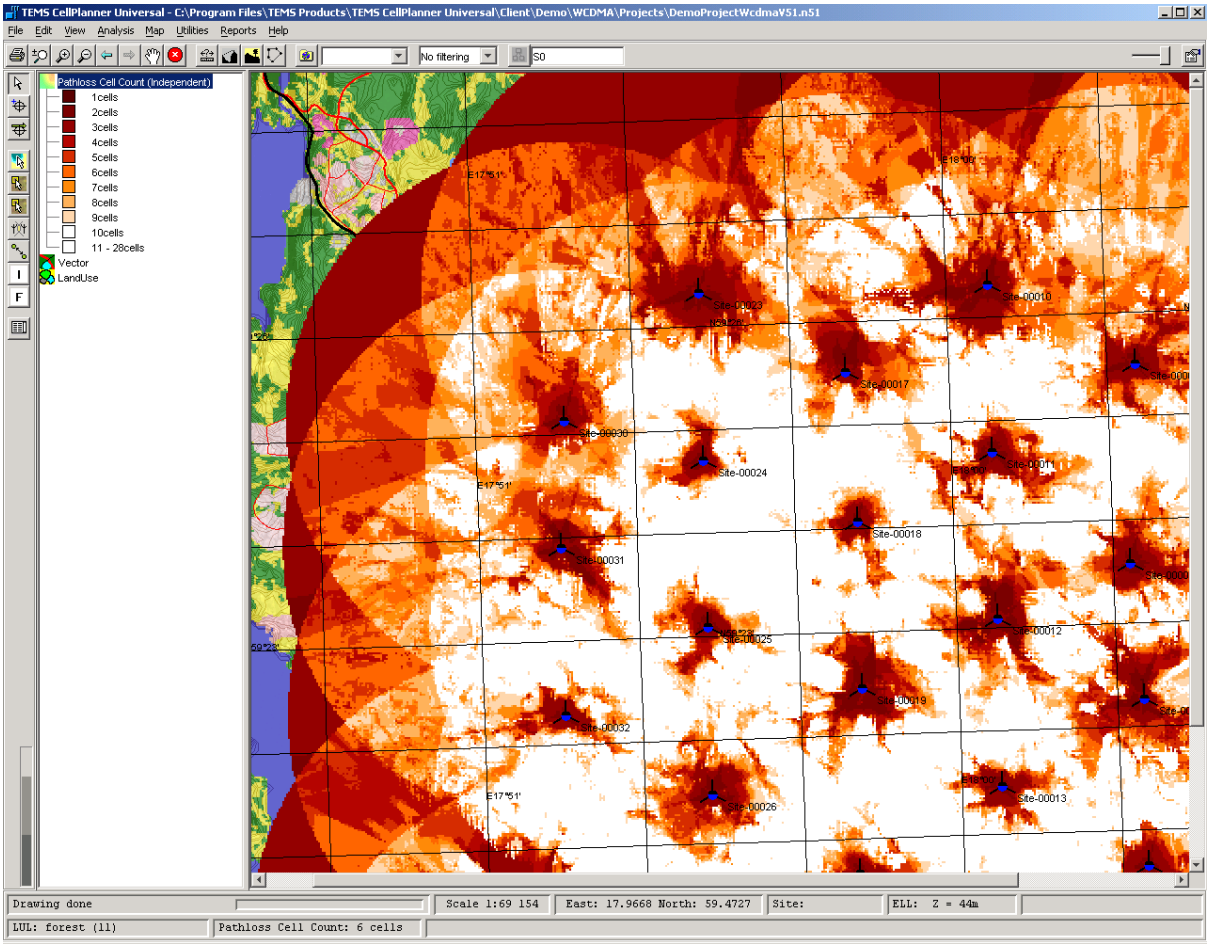
Subscriber Independent Pathloss Cell Count

The cell count displays the total cells for which a pathloss value is available at any position in the network.

In the plot property window you can select to apply certain threshold values to this display.

Example Plot

The following example shows subscriber Independent pathloss cell count plot:

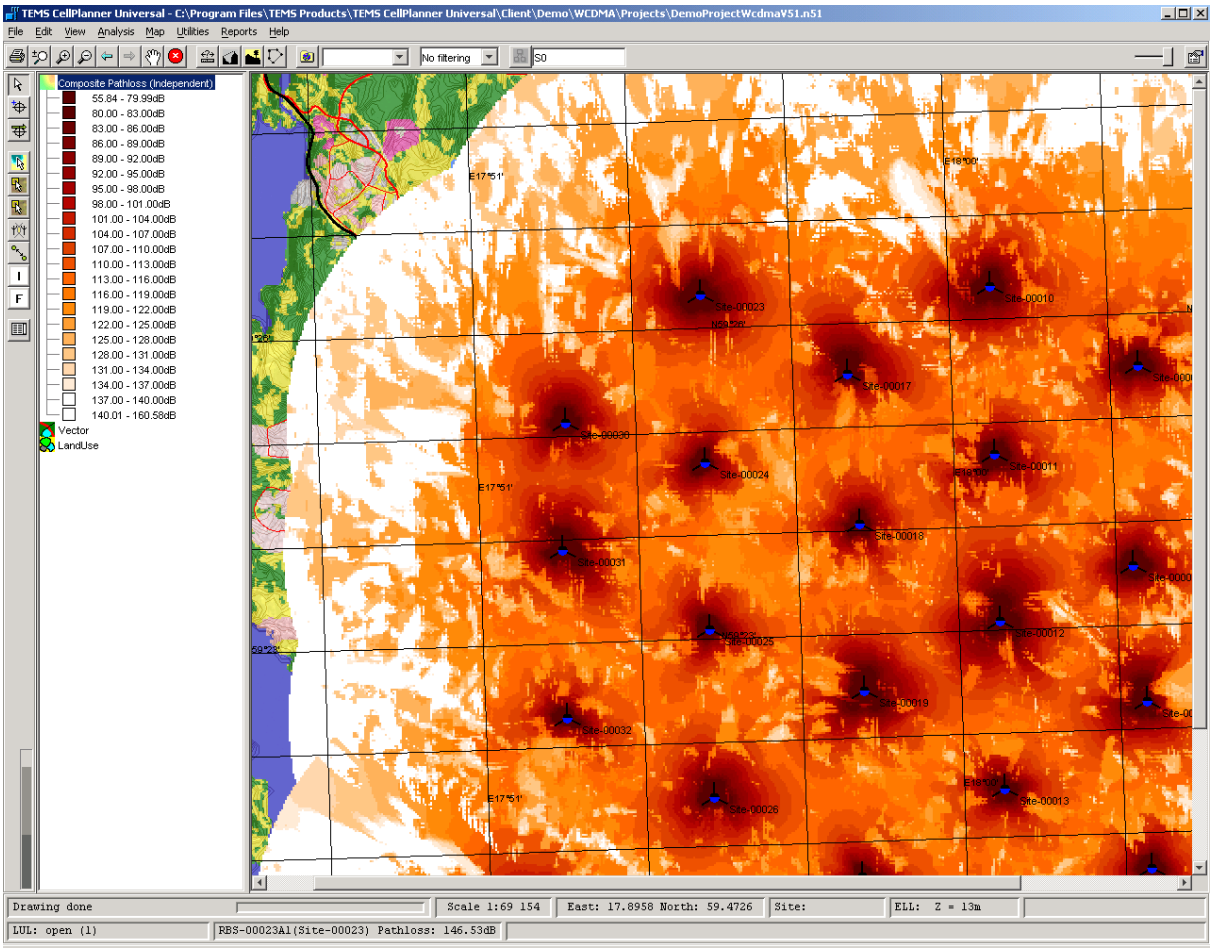


Subscriber Independent Pathloss - Composite Display

This plot shows the composite pathloss from all the cells in the network. The pathloss value is given in dB and is calculated from the best serving cell in any position in the network. In the plot property window you can apply certain threshold values to this display.

Example Plot

The following example shows the subscriber Independent pathloss composite plot:



WCDMA Service Independent Plots

The result from WCDMA Analysis with option **Service independent** enabled can be displayed as service independent plots, that is, bearer independent.

Service independent plots are calculated for the selected frequency with **Default terminal type settings**, see Set WCDMA Analysis Calculation Results Parameters.

(Other plots are calculated per traffic case, that is per bearer and average terminal derived from the distribution of terminals supporting the bearer in each traffic demand).

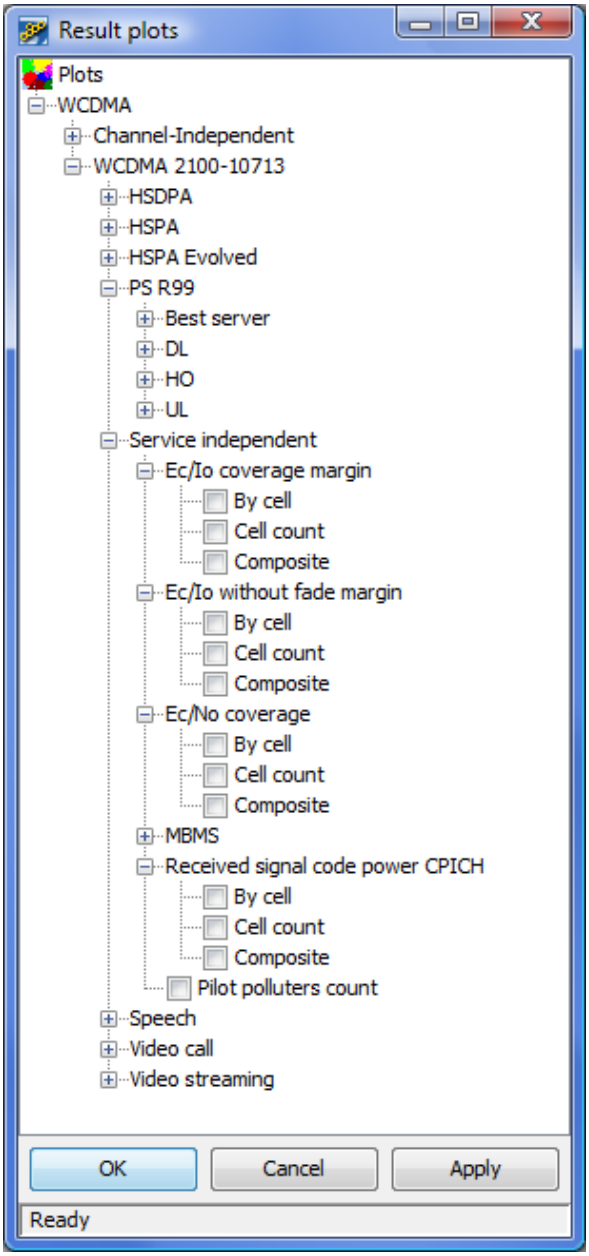
The service independent plots listed below can be generated per frequency:

- Ec/Io Coverage Margin by Cell
- Ec/Io Coverage Margin Cell Count
- Ec/Io Coverage Margin Composite
- Ec/Io Without Fade Margin by Cell
- Ec/Io Without Fade Margin Cell Count
- Ec/Io without Fade Margin Composite
- Ec/No Coverage By Cell
- Ec/No Coverage Cell Count
- Ec/No Coverage Composite
- MBMS, described in separate section MBMS Plots
- Received Signal Code Power CPICH by Cell
- Received Signal Code Power CPICH Cell Count
- Received Signal Code Power CPICH Composite
- Pilot Polluters Count

The plots are grouped according to the following criteria:

- *E_c/I_o coverage margin*
  Individual bearer/terminal combinations for pilot channel (CPICH) coverage.
- *E_c/I_o coverage without fade margin*
  Individual bearer/terminal combinations for pilot channel (CPICH) coverage without considering the fade margins.
- *E_c/N_o coverage*
  Individual bearer/terminal combinations for E_c/N_o coverage.
- *Received signal code power CPICH*
  RSCP value for each bin in the network. Plots for specific bearer/terminal combinations.
- *Pilot polluters count*
  Displays cells that cause interference in the bin. The cells in the active set are not counted as pilot polluters.

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example including WCDMA service independent plots:



The subsequent pages describe and exemplify the service independent plots.

Ec/Io Coverage Margin by Cell

The Ec/Io Coverage Margin by Cell plot displays the difference (in dB) between the Ec/Io seen by the subscriber and the minimum Ec/Io threshold, minus the fade margin.

When the calculated value is lower than zero, the coverage goal is not achieved. Coverage is not binary, so a value below zero means that the coverage confidence is lower than the target. A value which is M_{link}DL dB below the target still implies a 50% coverage probability.

The plot shows the best server coverage area of every cell, with different colors for adjacent cells. The pathloss is coded as a saturation level of the color.

The plot displays the downlink CPICH quality in terms of Ec/Io, considering the chip energy from the best serving cell and the total DL interference received by a mobile terminal in a particular position in the network. The values are calculated as a margin from the minimum CPICH quality threshold set in WCDMA analysis with the parameter *Min.DL Ec/Io for CPICH (dB)*.

The margin is calculated from the following equation:

$$E_C/I_O = RSCP/I$$

where

E_C/I_O) min = min downlink E_C/I_O for CPICH

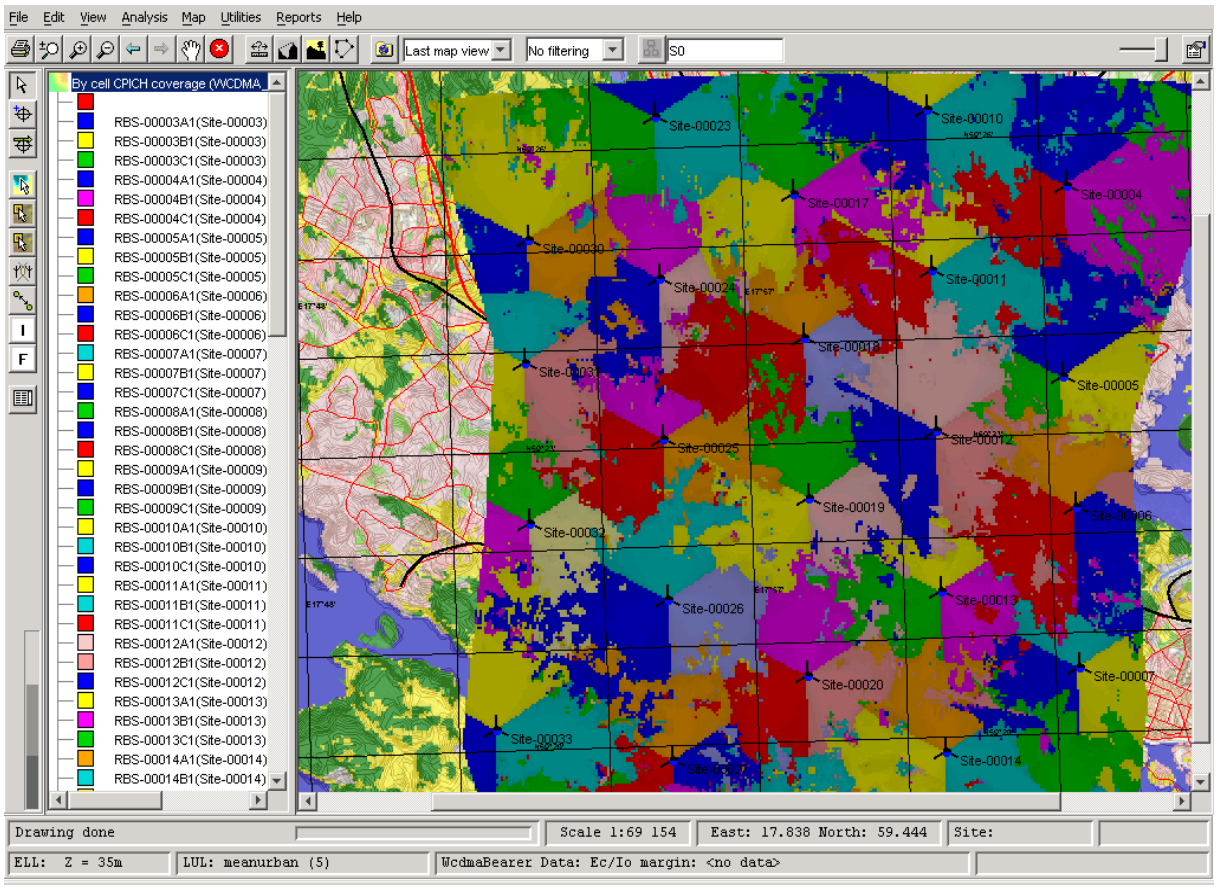
RSCP = received signal code power

I = interference power, the total received WCDMA power where the orthogonal part of the cell output power has been subtracted.

The threshold value is the minimum CPICH quality required in any area of the network for the mobile to correctly detect and decode the pilot channel of the best serving cell. The plot shows the margin remaining until the minimum threshold is obtained. A positive margin means that a specific position in the network provides CPICH coverage with sufficient quality. A negative margin means that quality requirements for CPICH are not met in that position.

Example Plot

The following example shows the Ec/Io Coverage by Cell in 3D plot:



Ec/Io Coverage Margin Cell Count

The Ec/Io Coverage Margin Cell Count plot displays the difference (in dB) between the Ec/Io seen by the subscriber and the minimum Ec/Io threshold, minus the fade margin.

When the calculated value is lower than zero, the coverage goal is not achieved. Coverage is not binary, so a value below zero means that the coverage confidence is lower than the target. A value which is M_{link}DL dB below the target still implies a 50% coverage probability.

Every bin is color coded according to the number of cells that can be seen in the bin with a pathloss below the pre-set threshold.

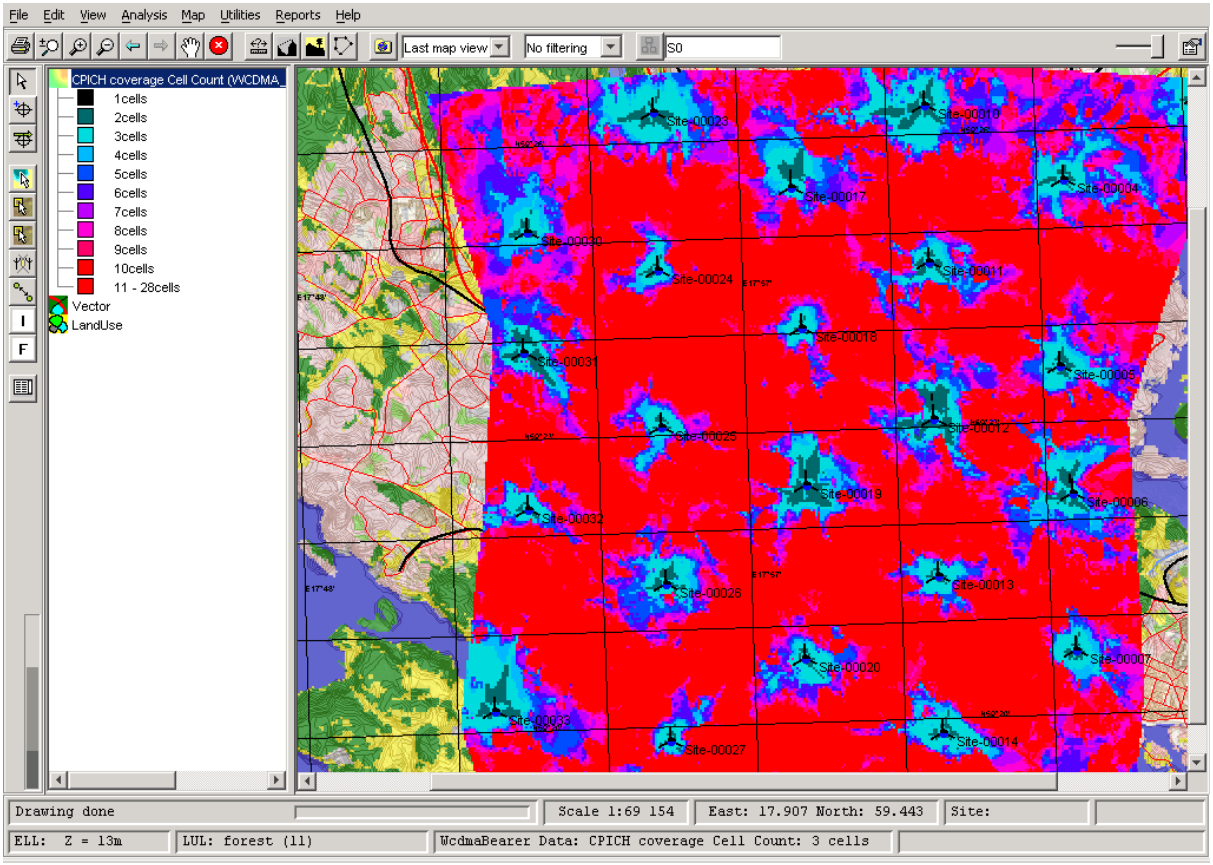
The plot does not consider if the quality of the pilot signals from the cells is sufficient for the mobile to detect all pilot signals, but indicates when too many cells cover the same position, the areas where you can expect pilot pollution problems.

Using the spider/handover cursor with the plot, you can obtain an indication of:

- Number of pilots converging in the same area
- Ec/Io achieved for the pilot signals
- Cells contributing to pilot coverage and possible pilot pollution

Example Plot

The following example shows the Ec/Io Coverage Margin Cell Count plot:



Ec/Io Coverage Margin Composite

The Ec/Io Coverage Margin Composite plot displays the difference (in dB) between the Ec/Io seen by the subscriber and the minimum Ec/Io threshold, minus the fade margin.

When the calculated value is lower than zero, the coverage goal is not achieved. Coverage is not binary, so a value below zero means that the coverage confidence is lower than the target. A value which is M_{link}DL dB below the target still implies a 50% coverage probability.

Every bin is color coded according to the pathloss of the best serving cell seen in the bin.

The plot always shows the Ec/Io margin from the best serving cell, providing an overview of the combined CPICH coverage for the network without distinguishing between best serving cells. Information on the best serving cell in any position of the network is provided in the status bar.

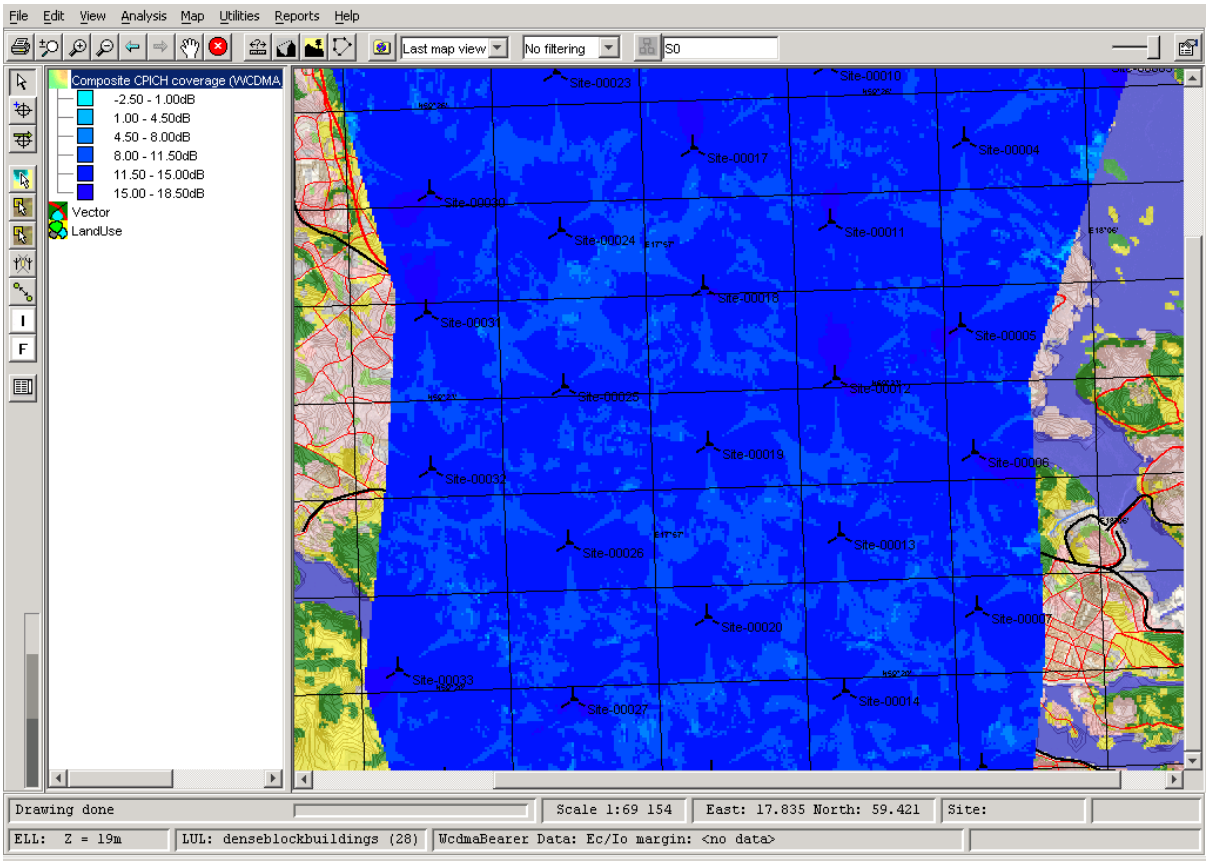
Threshold Values

The plot displays the downlink CPICH quality in terms of Ec/Io, considering chip energy from the best serving cell and total DL interference received by a mobile terminal in a specific position in the network. Values are calculated as a margin of the minimum CPICH quality threshold set for WCDMA analysis with the parameter *Min.DL Ec/Io for CPICH (dB)*.

The threshold value is the minimum CPICH quality required in any area of the network for the mobile to correctly detect and decode the pilot channel of the best serving cell. The plot shows the margin remaining until the minimum threshold value is reached. A positive margin means that a specific position in the network provides CPICH coverage with sufficient quality. A negative margin means that quality requirements for CPICH are not met in the position.

Example Plot

The following example shows the Ec/Io Coverage Margin Composite plot:



Ec/Io Without Fade Margin by Cell

The Ec/Io without Fade Margin by Cell plot displays the Ec/Io (in dB) seen by the subscriber. Neither the threshold nor the fade margin is subtracted. The plot shows the best server coverage area of every cell, with different colors for adjacent cells.The pathloss is coded as a saturation level of the color.

The plot displays the downlink CPICH quality in terms of Ec/Io, considering the chip energy from the best serving cell and the total DL interference received by a mobile terminal in a particular position in the network. These values do not consider the fading margins applied.

The CPICH quality is calculated from the following equation:

$$M_{Ec/Io} = RSCP/I - (E_C/I_O)_{min}$$

where

E_C/I_O min = minimum downlink E_C/I_O for CPICH

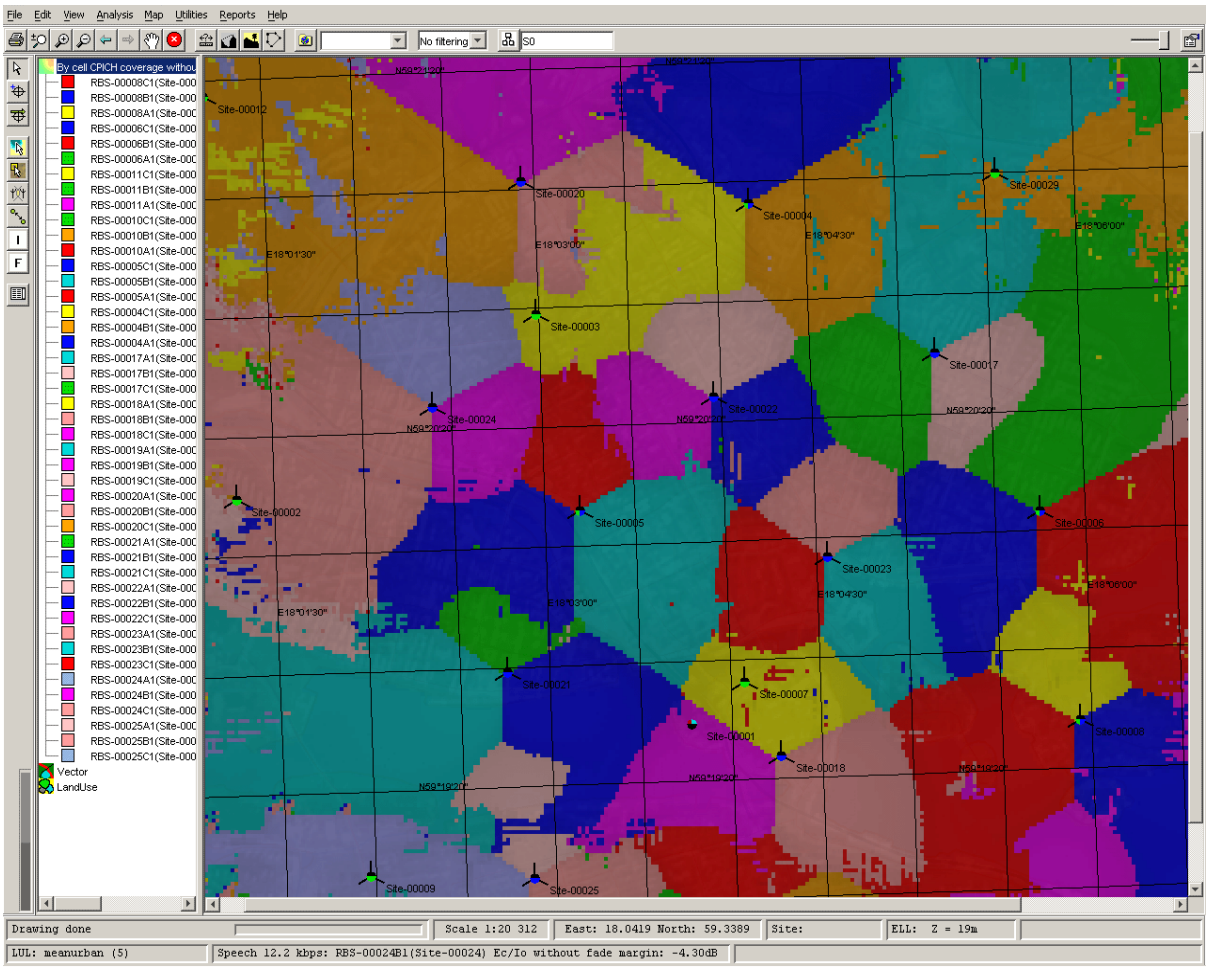
RSCP = received signal code power

I = interference power, the total received WCDMA power where the orthogonal part of the cell output power has been subtracted.

The plot allows you to assess the CPICH coverage without the impact of fading on the CPICH signal.

Example Plot

The following example shows the Ec/Io without Fade Margin by Cell plot:



Ec/Io Without Fade Margin Cell Count

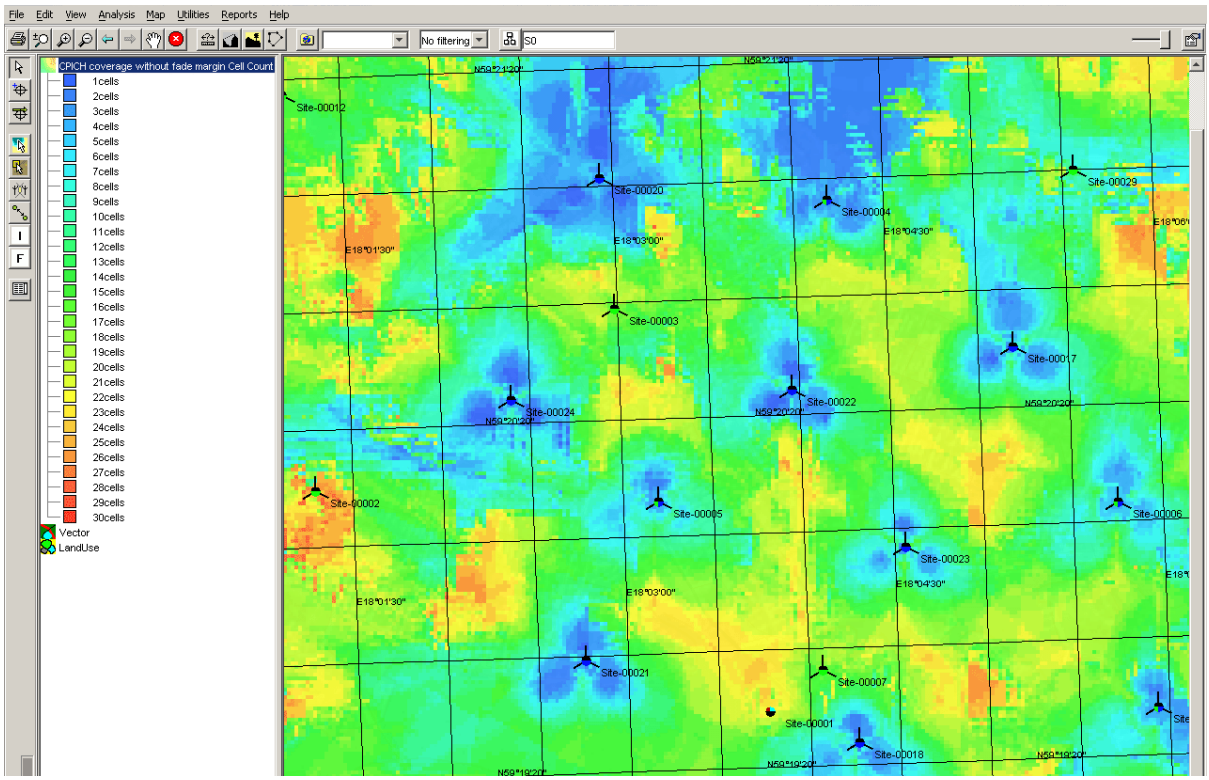
The Ec/Io without Fade Margin Cell Count plot displays the Ec/Io (in dB) seen by the subscriber. Neither the threshold nor the fade margin is subtracted. Every bin is color coded according to the number of cells that can be seen in the bin with a pathloss below the pre-set threshold.

The plot displays the downlink CPICH coverage for pilot channels covering a specific position in the network, without considering effects of fading on the pilot channel signal or if the actual quality of the pilot signals from the cells is sufficient for the mobile to detect all pilot signals. The plot indicates if the number of cells covering the same network position is too large, those areas where you can expect pilot pollution problems. Using the spider/handover cursor together with the plot, you can view information on the:

- Number of pilots are converging the same area
- Ec/Io achieved for pilot signals
- Cells contributing to pilot coverage and possible pilot pollution

Example Plot

The following is an example of the Ec/Io without Fade Margin Cell Count plot:



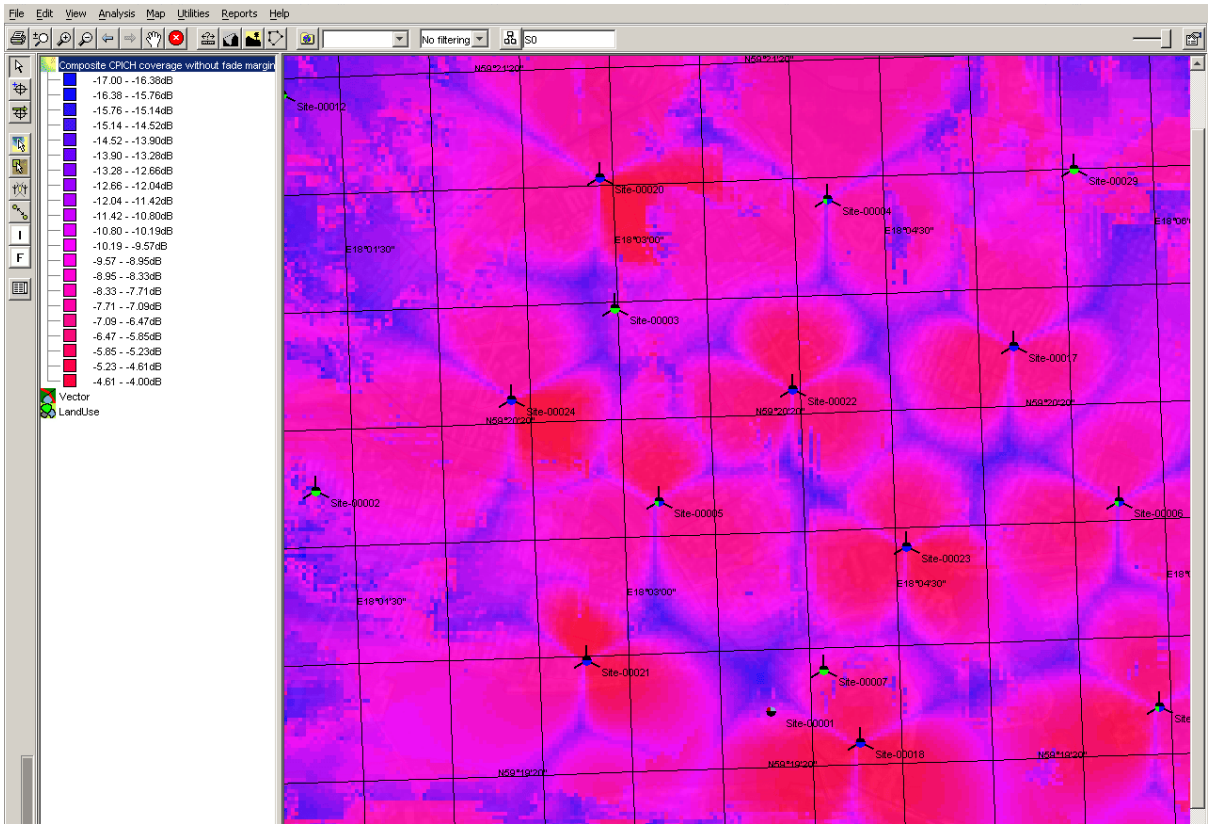
Ec/Io without Fade Margin Composite

The Ec/Io without Fade Margin Composite plot displays the Ec/Io (in dB) seen by the subscriber. Neither the threshold nor the fade margin is subtracted. Every bin is color coded according to the pathloss of the best serving cell seen in the bin. The plot assesses the CPICH coverage without the impact of fading on the CPICH signal and provides best server data. It displays the downlink Ec/Io, considering chip energy from the best serving cell and total DL interference received by a mobile terminal in a particular position in the network. The values are calculated without the fading margins applied.

The plot always shows the Ec/Io margin from the best serving cell by giving an overview of the combined Ec/Io coverage without distinguishing between the best serving cells. Information on the best serving cell in any position of the network is provided in the status bar. Use the handover/spider curser to obtain details on the number, identity and CPICH margin for the cells covering a particular position or area.

Example Plot

The following example shows the Ec/Io without Fade Margin Composite plot:



Ec/No Coverage By Cell

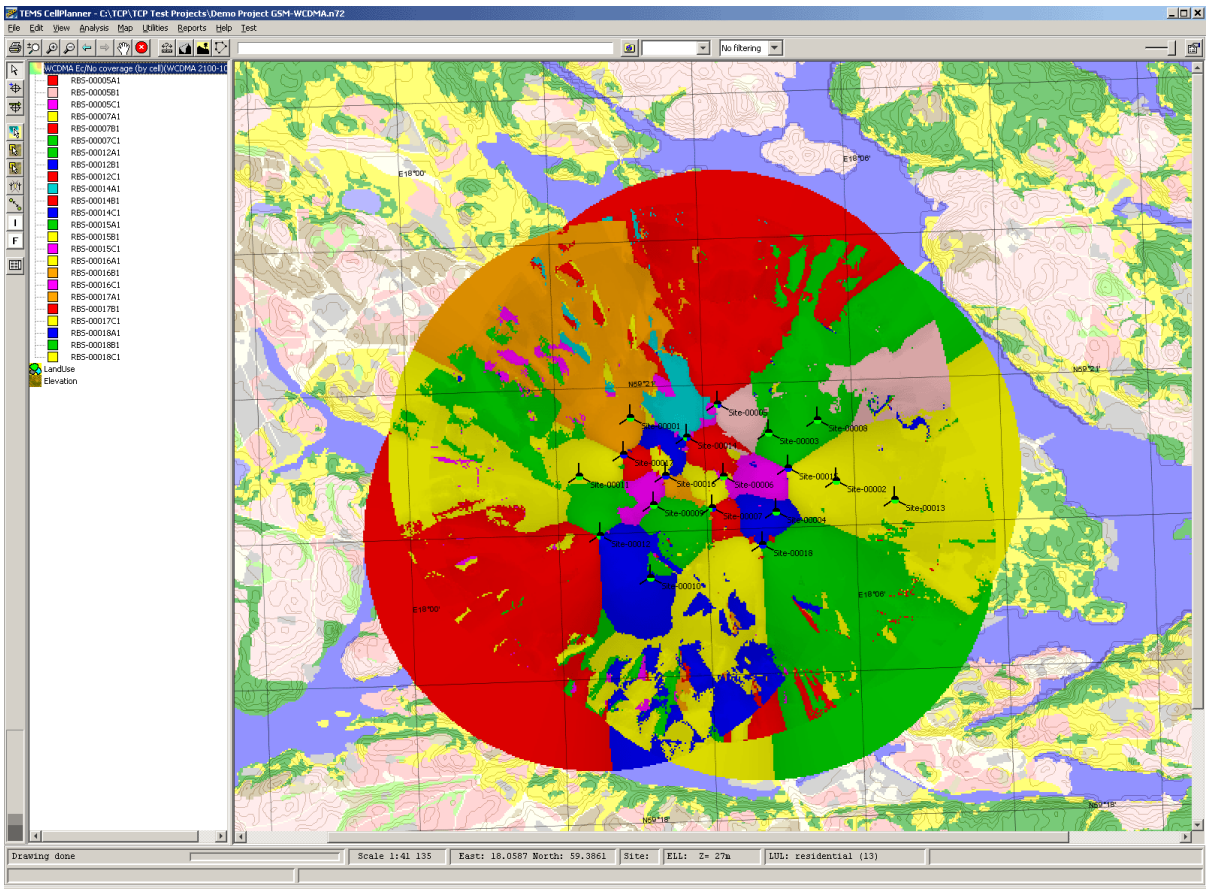
The Ec/No Coverage by Cell plot displays the Ec/No (in dB) seen by the subscriber. Ec/No is defined as the Received signal code power (RSCP) of the CPICH in dB minus the Received Signal Strength Indicator (RSSI) in dB.

RSSI is the sum of all interference and noise power in the terminal's receiver. The difference between Ec/No and Ec/Io is that in Ec/Io, the orthogonal part of the interference from the best serving cell, is removed from the interference term, so Ec/No is always lower than Ec/Io.

The plot shows the best server coverage area of every cell, with different colors for adjacent cells. The pathloss is coded as a saturation level of the color.

Example Plot

The following example shows the Ec/No coverage by cell plot:



Ec/No Coverage Cell Count

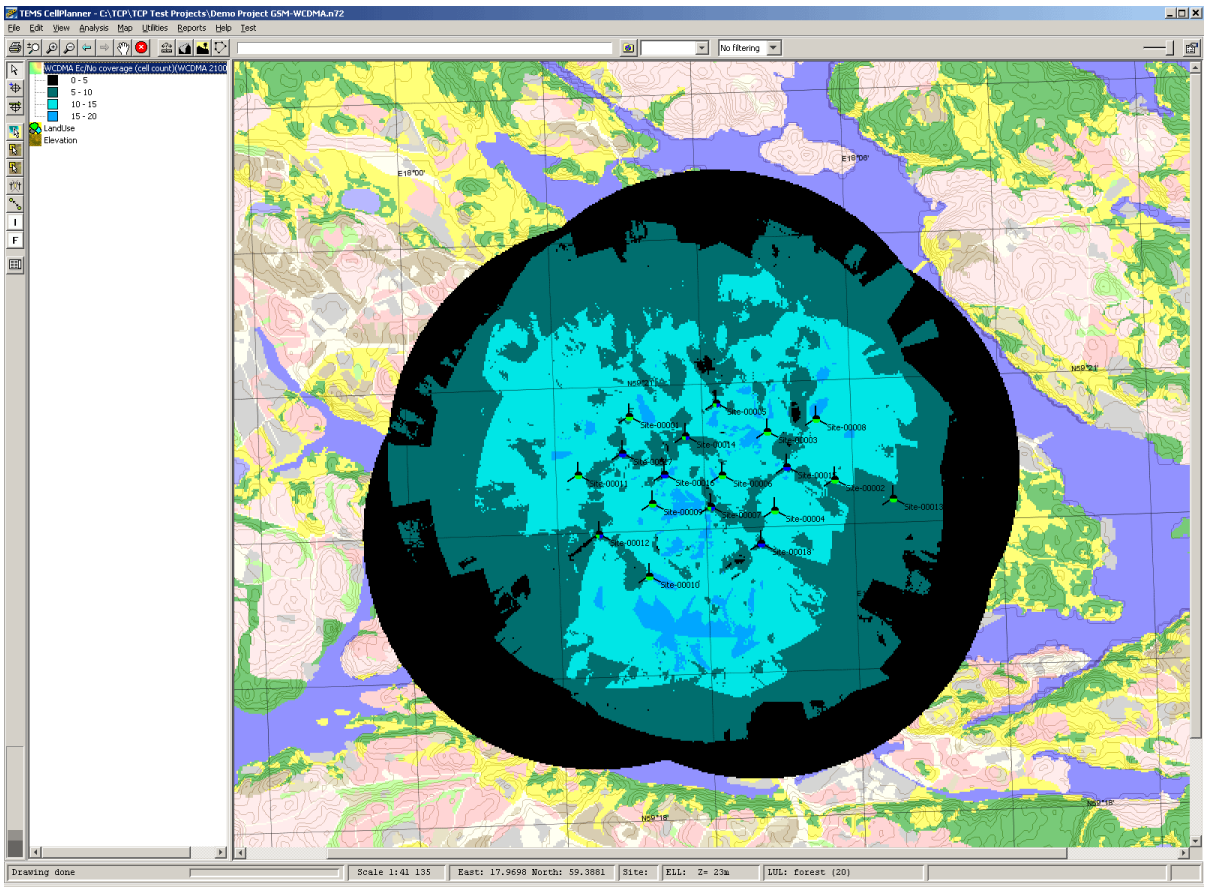
The Ec/No Coverage Cell Count plot displays the Ec/No (in dB) seen by the subscriber. Ec/No is defined as the Received signal code power (RSCP) of the CPICH in dB minus the Received Signal Strength Indicator (RSSI) in dB.

RSSI is the sum of all interference and noise power in the terminal's receiver. The difference between Ec/No and Ec/Io is that in Ec/Io, the orthogonal part of the interference from the best serving cell, is removed from the interference term, so Ec/No is always lower than Ec/Io.

The plot shows the number of bins covered in each cell in the area. Every bin is color coded according to the number of cells that can be seen in the bin with a pathloss below the pre-set threshold.

Example Plot

The following example shows the Ec/No coverage cell count plot:



Ec/No Coverage Composite

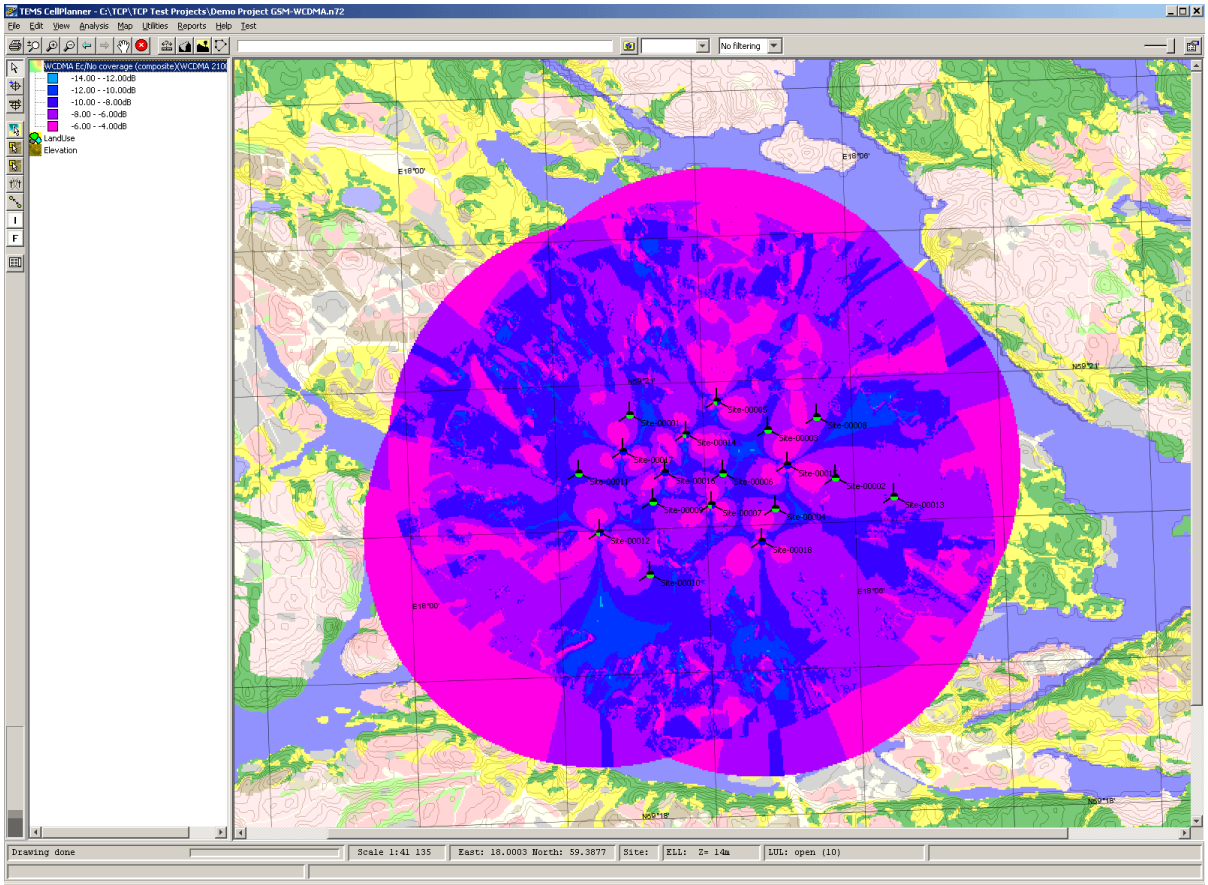
The Ec/No Coverage Composite plot displays the Ec/No (in dB) seen by the subscriber. Ec/No is defined as the Received signal code power (RSCP) of the CPICH in dB minus the Received Signal Strength Indicator (RSSI) in dB.

RSSI is the sum of all interference and noise power in the terminal's receiver. The difference between Ec/No and Ec/Io is that in Ec/Io, the orthogonal part of the interference from the best serving cell has been removed from the interference term. Hence, Ec/No is always lower than Ec/Io.

The plot shows the Ec/No coverage as a composite of every bin. Every bin is color coded according to the pathloss of the Best serving cell seen in the bin.

Example Plot

The following example shows the Ec/No coverage composite plot:



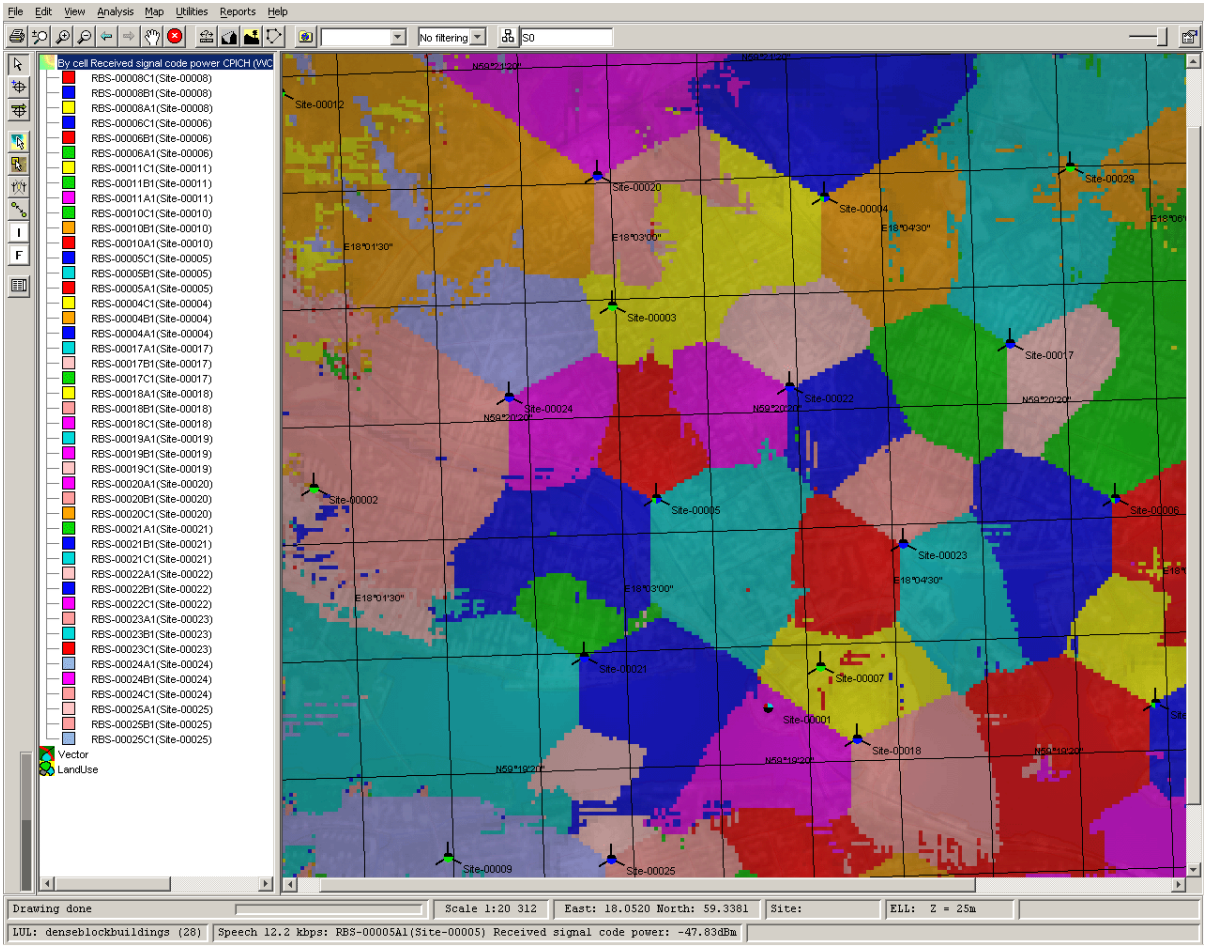
Received Signal Code Power CPICH by Cell

The Received Signal Code Power CPICH by Cell plot displays the power (in dBm) of the CPICH of the Best serving cell when received by the subscriber. The received signal code power (RSCP) for the common pilot channel is a parameter that can be measured by drive test equipment and is used for tuning and optimizing the WCDMA radio network.

RSCP plots allow you to compare the predicted RSCP for the network plan with the drive test results. The RSCP plots do not consider the fade margins applied during WCDMA analysis. The RSCP value is provided in dBm.

Example Plot

The following example shows the received signal code power CPICH by cell plot:



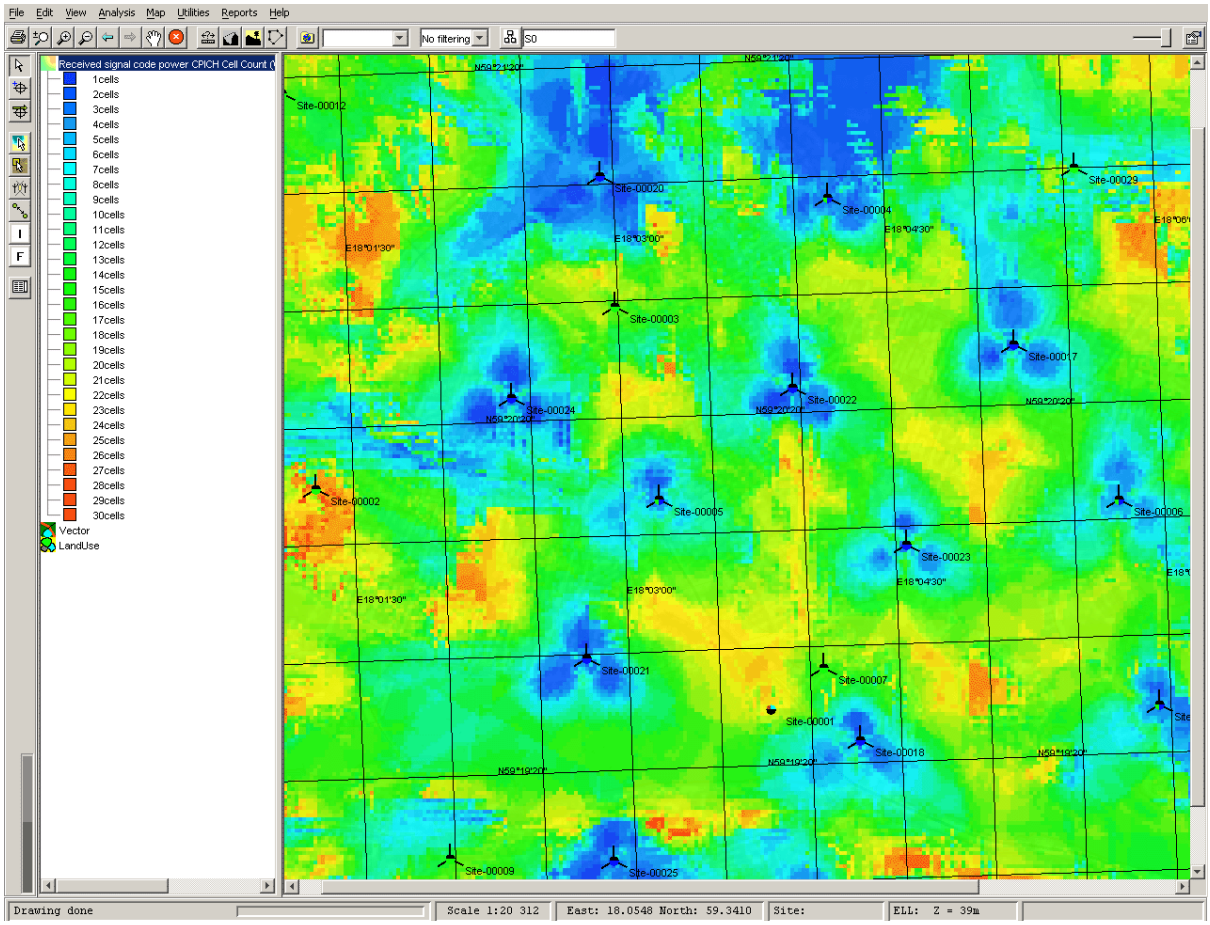
Received Signal Code Power CPICH Cell Count

The Received Signal Code Power CPICH Cell Count plot displays the power (in dBm) of the CPICH of the Best serving cell when received by the subscriber. The received signal code power (RSCP) for the common pilot channel is a parameter that can be measured by drive test equipment and is used for tuning and optimizing the WCDMA radio network.

RSCP plots allow you to compare the predicted RSCP for the network plan with the drive test results. The RSCP plots do not consider the fade margins applied during WCDMA analysis. The RSCP value is provided in dBm. The plot shows the cells that cover the same area or position with a power level that is higher than the one specified by you as count threshold in the **Legend Properties** window.

Example Plot

The following example shows the Received Signal Code Power CPICH Cell Count plot:



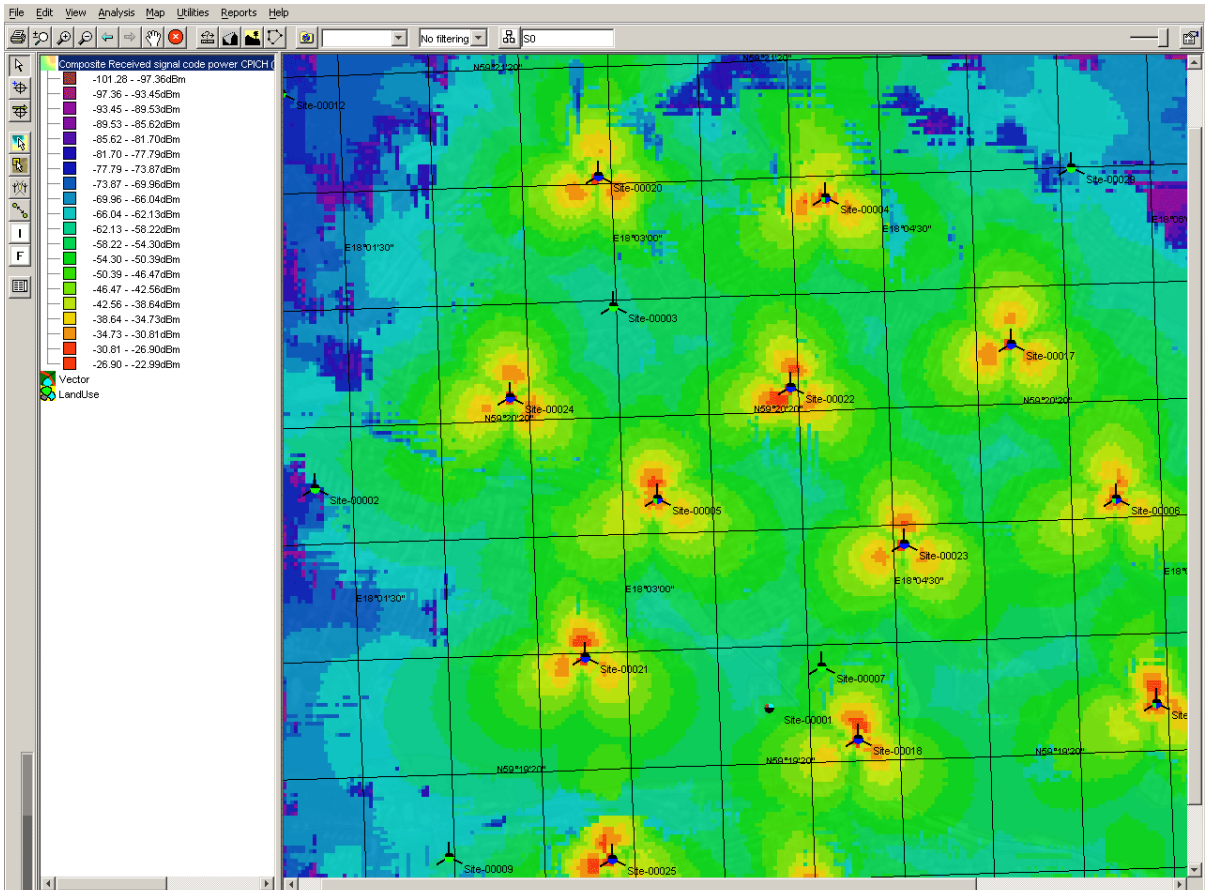
Received Signal Code Power CPICH Composite

The Received Signal Code Power CPICH Composite plot displays the power (in dBm) of the CPICH of the Best serving cell when received by the subscriber. The received signal code power (RSCP) for the common pilot channel is a parameter that can be measured by drive test equipment and is used for tuning and optimizing the WCDMA radio network.

RSCP plots allow you to compare the predicted RSCP for the network plan with the drive test results. The RSCP plots do not consider the fade margins applied during WCDMA analysis. The RSCP value is provided in dBm. The plot shows the composite RSCP as received by a particular bin from the corresponding best serving cell in the network. The RSCP value and the corresponding best serving cell information is updated as you move the cursor to another position.

Example Plot

The following example shows the Received Signal Code Power CPICH Composite plot:



Pilot Polluters Count

The Pilot Polluters Count plot allows you to evaluate pilot pollution in the network. The plot shows pilot polluters existing in any position of the network.

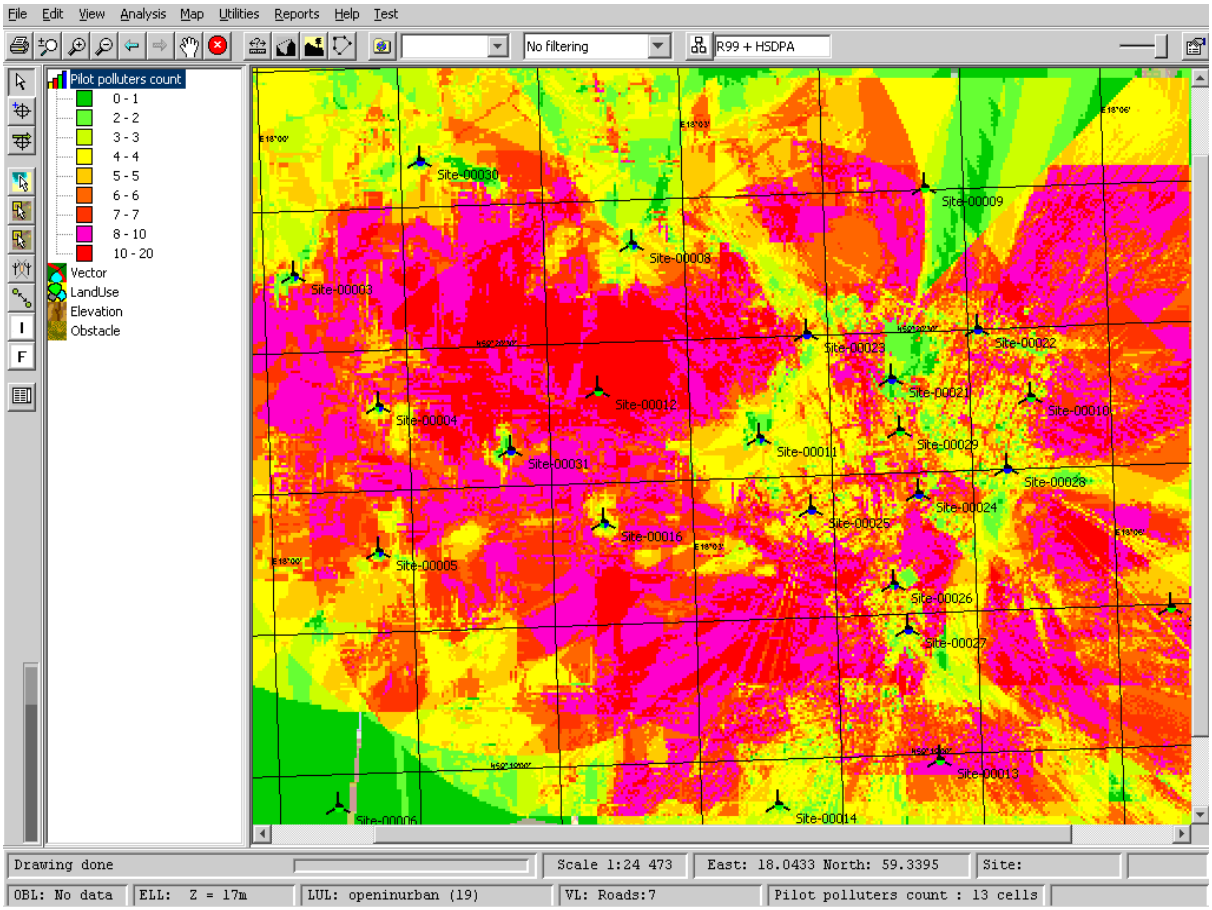
A pilot polluter is a cell that covers a bin in the network with a strong pilot channel quality, but which is not part of the handover connection for that bin nor can it be a handover candidate due to missing traffic channel coverage.

Reasons for cells to appear as pilot polluter might be:

- Too strong transmit power on CPICH
  - The cell transmits with strong CPICH power, but is not considered as one of the possible best serving cells for this bin.
- Limitation on Active Set size:
  - Normally only 3 cells are allowed into the Active Set for soft and softer handover connections. Other cells with strong pilot signals will be perceived as interferers.
- Too high antenna position
  - The antenna position of the polluting cell is too high, which results in a strong pilot channel coverage in areas, where the cell is not supposed to provide traffic channel coverage.
- Insufficient antenna down-tilt
  - The antenna down-tilt angle of the polluting cell is too small, which results in a strong pilot channel coverage in areas, where the cell is not supposed to provide traffic channel coverage.

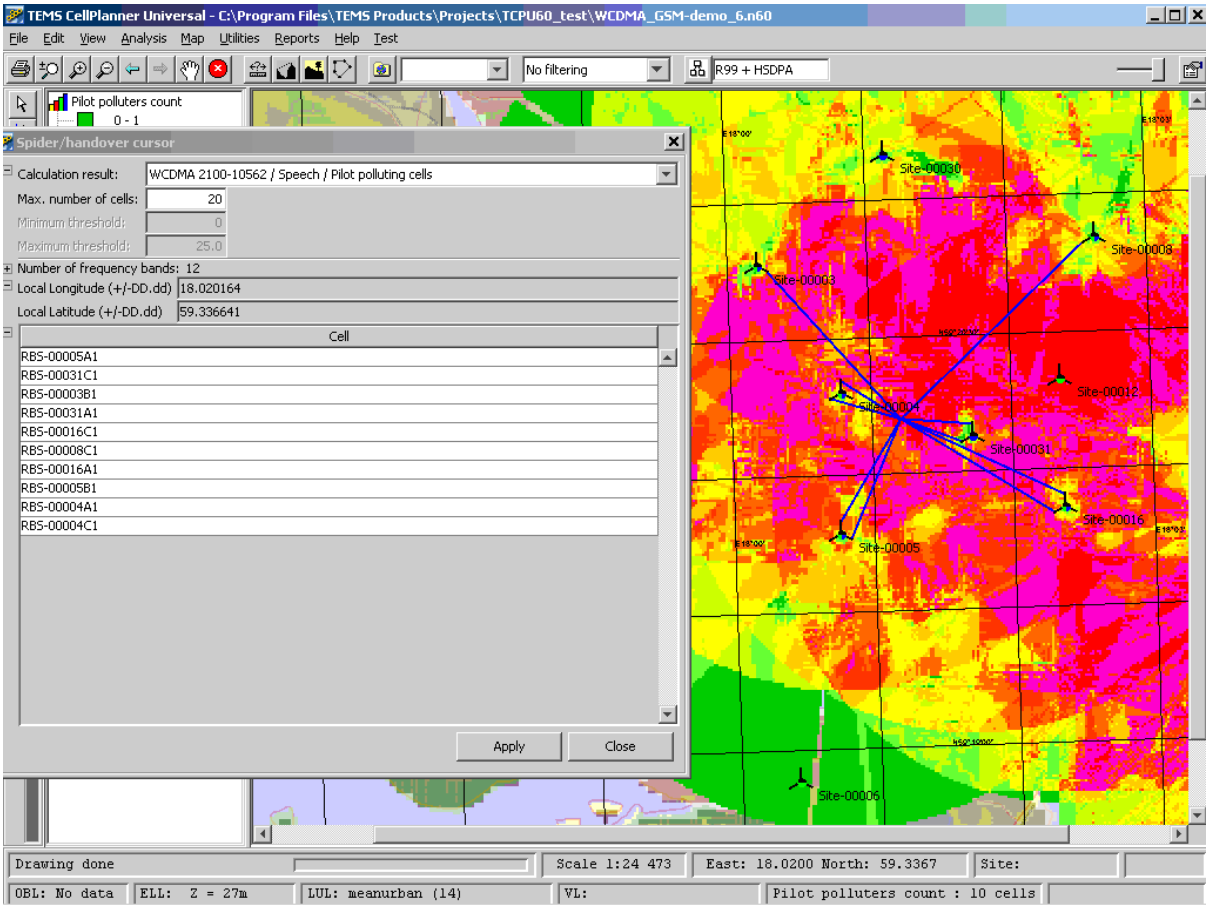
Example Plot

Use the Pilot Polluter Count plot to visualize areas with strong pilot pollution and to evaluate the pilot polluters, as shown in the example below:



Detailed Analysis with Spider Cursor

A more detailed analysis of cells that contribute to strong pilot pollution in the network can be made by use of the Handover/spider Cursor along with the Pilot Polluter Count plot:



How the Handover/Spider Cursor Works

The Handover/spider Cursor pinpoints those cells that cover the selected bin with CPICH coverage, but do not contribute to a handover connection, nor are they the handover candidate cells for that position.

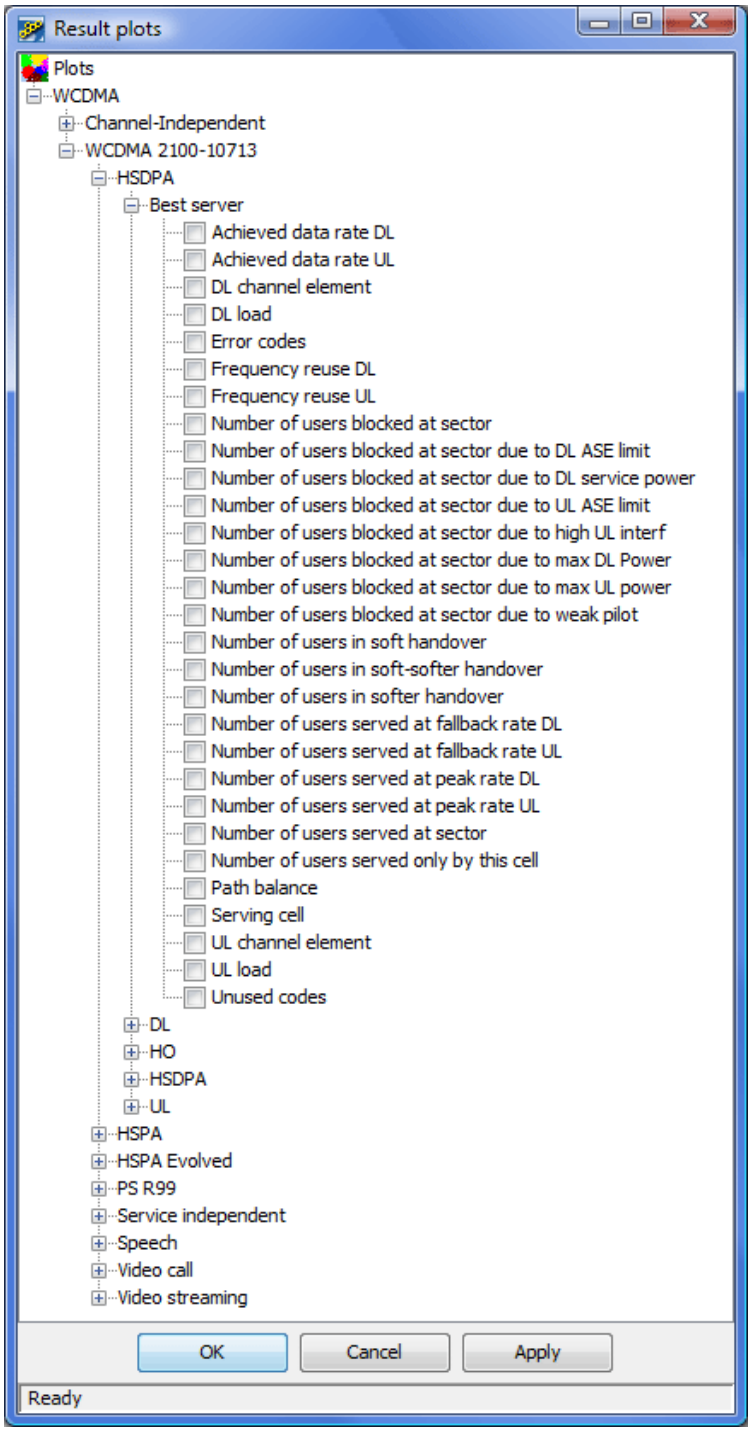
For details on definition and generation of pilot pollution plots refer to the *TEMS CellPlanner WCDMA Technical Reference Manual*.

WCDMA Best Server Plots

The result from WCDMA Analysis with option **Best server coverage** enabled can be displayed as the following best server plots, generated per frequency and service (WCDMA bearer):

- Achieved Data Rate DL
- Achieved Data Rate UL
- Coverage
- DL Channel Element
- DL Load
- Error Codes
- Frequency Reuse DL
- Frequency Reuse UL
- Users Blocked at Sector
- Users Blocked at Sector Due to DL ASE Limit
- Users Blocked at Sector Due to DL Service Power
- Users Blocked at Sector Due to UL ASE Limit
- Users Blocked at Sector Due to High UL Interference
- Users Blocked at Sector Due to Max DL Power
- Users Blocked at Sector Due to Max UL Power
- Users Blocked at Sector Due to Weak Pilot
- Number of Users in Soft Handover
- Number of Users in Soft-Softer Handover
- Number of Users in Softer Handover
- Users Served at Fallback Rate DL
- Users Served at Fallback Rate UL
- Users Served at Peak Rate DL
- Users Served at Peak Rate UL
- Users Served at Sector
- Users Served Only by this Cell
- Path Balance
- UL Channel Element
- UL Load
- Unused Codes

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example showing best server plots for HSDPA services:



The subsequent pages describe and exemplify the best server plots.

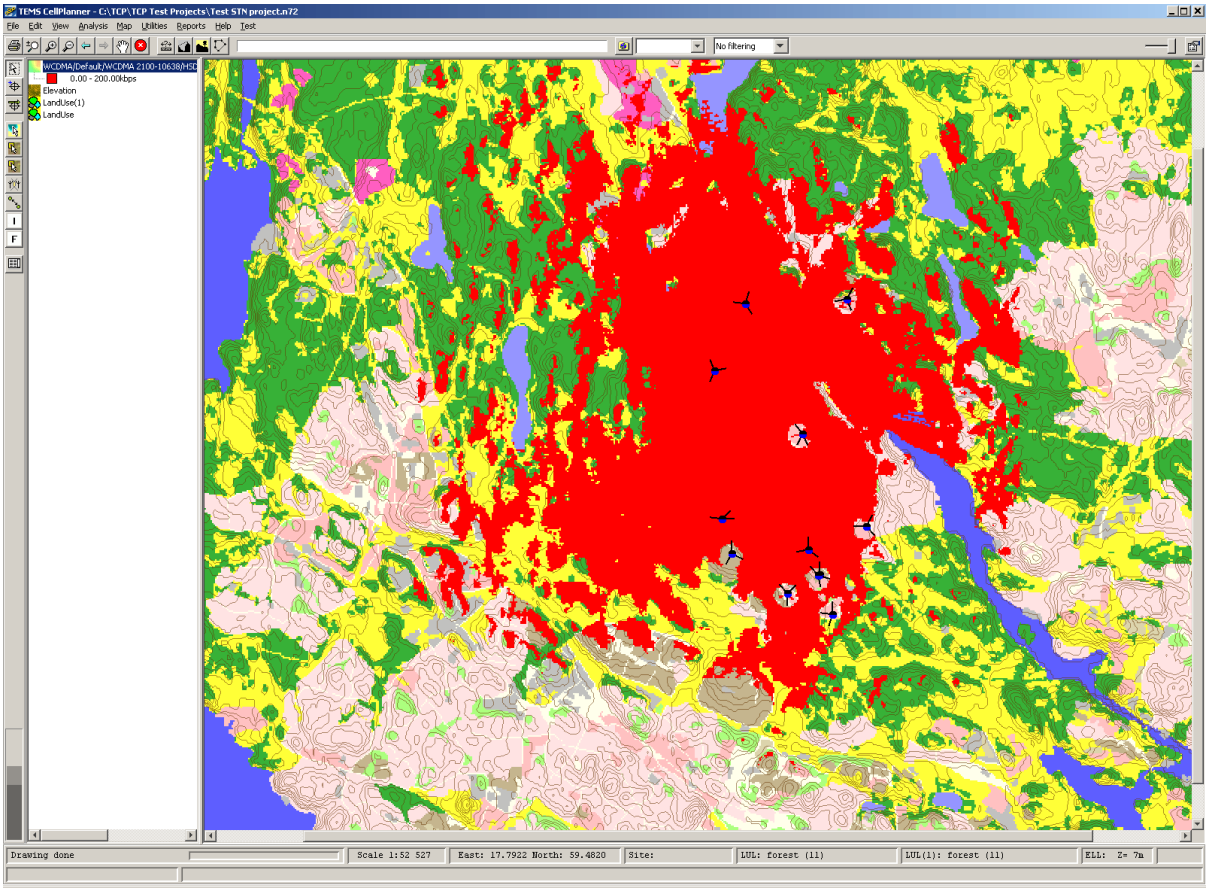
Achieved Data Rate DL

The Achieved Data Rate DL plot applies only to bearers using Peak power mode. The plot, color coded for every cell, shows the average value per cell over all subscribers using the selected bearer and being served by the cell of the maximum allowed DL bitrate. Inactive subscribers in the DL are considered (with bitrate = 0), but blocked subscribers are not included in the average value.

The parameter is called Achieved Data Rate DL in the WCDMA statistics report.

Example Plot

The following example shows the Achieved Data Rate DL plot:



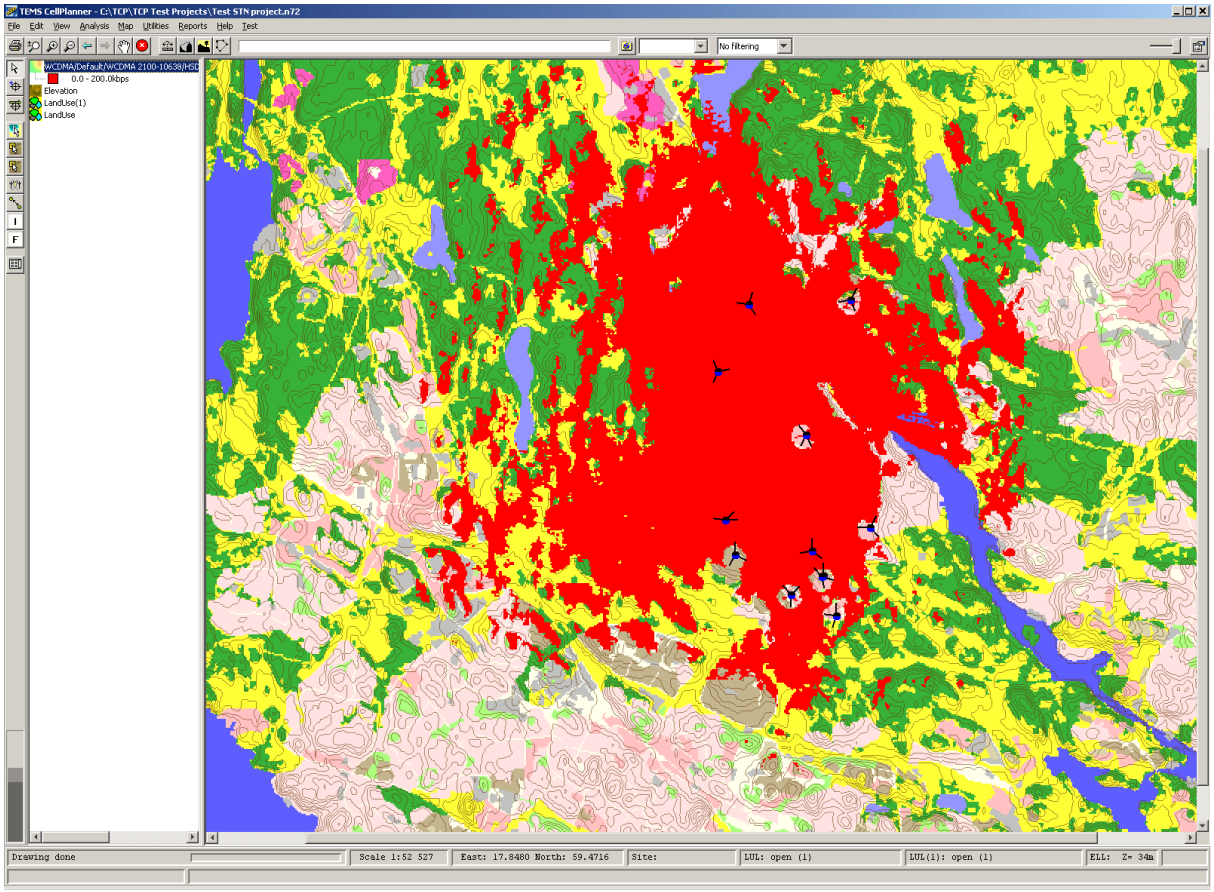
Achieved Data Rate UL

The Achieved Data Rate UL plot applies only to bearers using Peak power mode. The plot, color coded for every cell, shows the average value over all subscribers using the selected bearer and being served by the cell of the maximum allowed UL bitrate. Inactive subscribers in the UL are considered (with bitrate = 0), but blocked subscribers are not included in the average value.

The parameter is called Achieved Data Rate UL in the WCDMA statistics report.

Example Plot

The following example shows the Achieved Data Rate UL plot:



Coverage

The Coverage plot shows the best serving cell for any position in the network according to the selected frequency layer and the WCDMA bearer. The display depends on the best server ranking method selected for WCDMA analysis.

The plot is generated after WCDMA analysis has been run and considers both uplink and downlink traffic channel coverage, as well as the availability of sufficient pilot coverage.

The Coverage plot indicates which bins satisfy coverage on both uplink and downlink. All three coverage criteria (CPICH quality, UL link power, DL link power) must be fulfilled in order to display a covered bin. If a bin is not covered, the status bar indicates the unfulfilled criteria. In the Coverage plot, adjacent cells are displayed in different colors so that the best serving cell can be identified in the covered areas. The areas covered per land use code, along with the total coverage area, are shown in the plot.

Qualifications for Best Serving Cell

For a cell to qualify as the best serving cell, that cell must meet all the following conditions:

Condition	Description
Cell	• Belongs to the selected analysis region. • Achieved the highest rank in the best server ranking algorithm selected for WCDMA analysis.
CPICH quality	Ec/Io is above the threshold value as defined for WCDMA analysis.
Traffic channel quality	• In terms of achieved Eb/Io, downlink traffic channel must be above the specified threshold for the selected WCDMA bearer. • In terms of achieved Eb/Io, uplink traffic channel must be above the specified threshold for the selected WCDMA bearer.

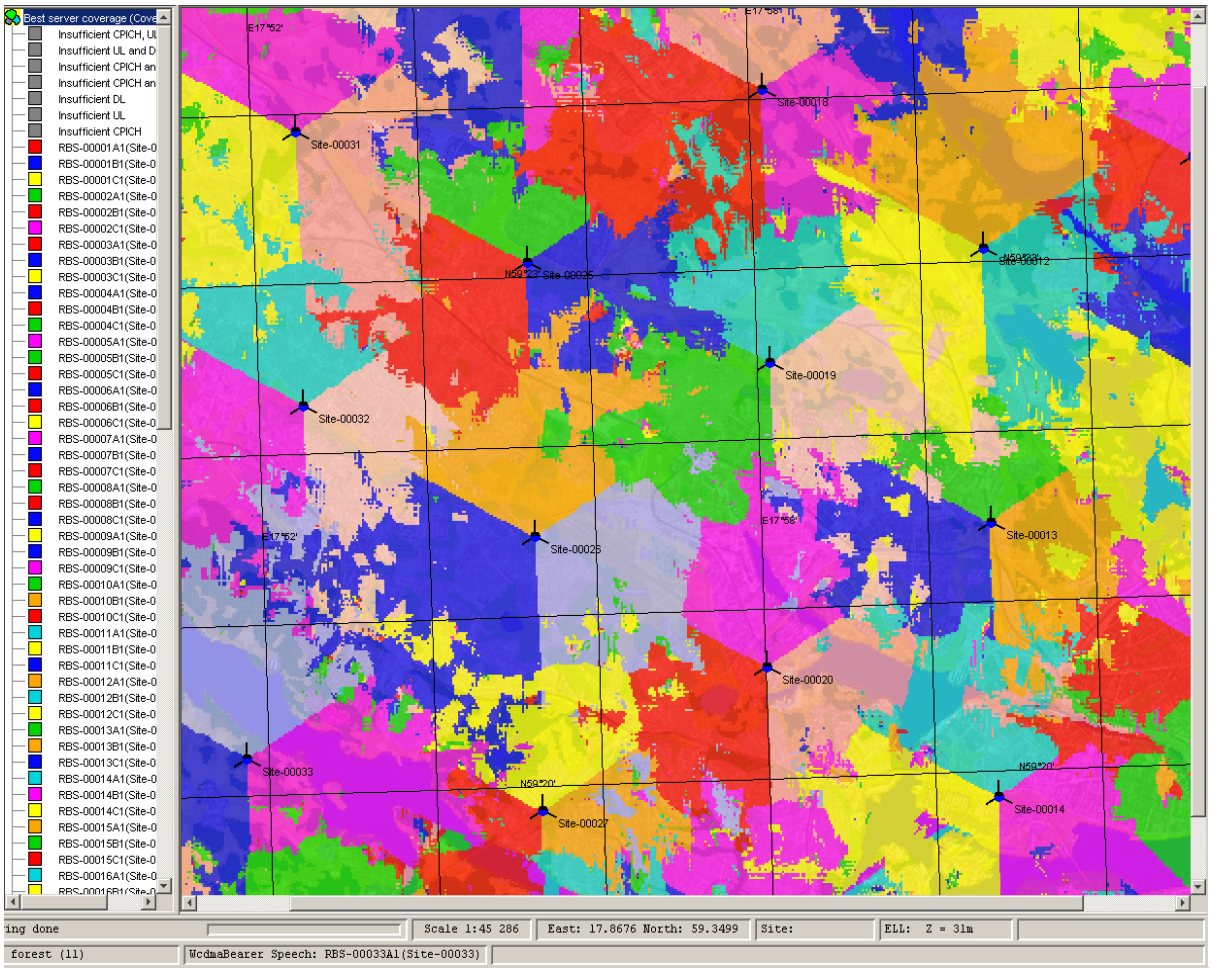
If available for the selected bin position, the possibility of soft or softer handover is taken into consideration for the best server coverage plot generation.

For any bin that cannot be connected to any cell in the network due to that one or more of the above conditions are not satisfied, the reason for not getting connected is displayed in the status bar.

Example Plot

The following example of the Coverage (Best Server) plot indicates the received signal strength of the strongest signal from any cell supporting the selected bearer. The status bar below the map window shows the signal strength for the best serving cell.

The following example shows the Coverage plot:



DL Channel Element

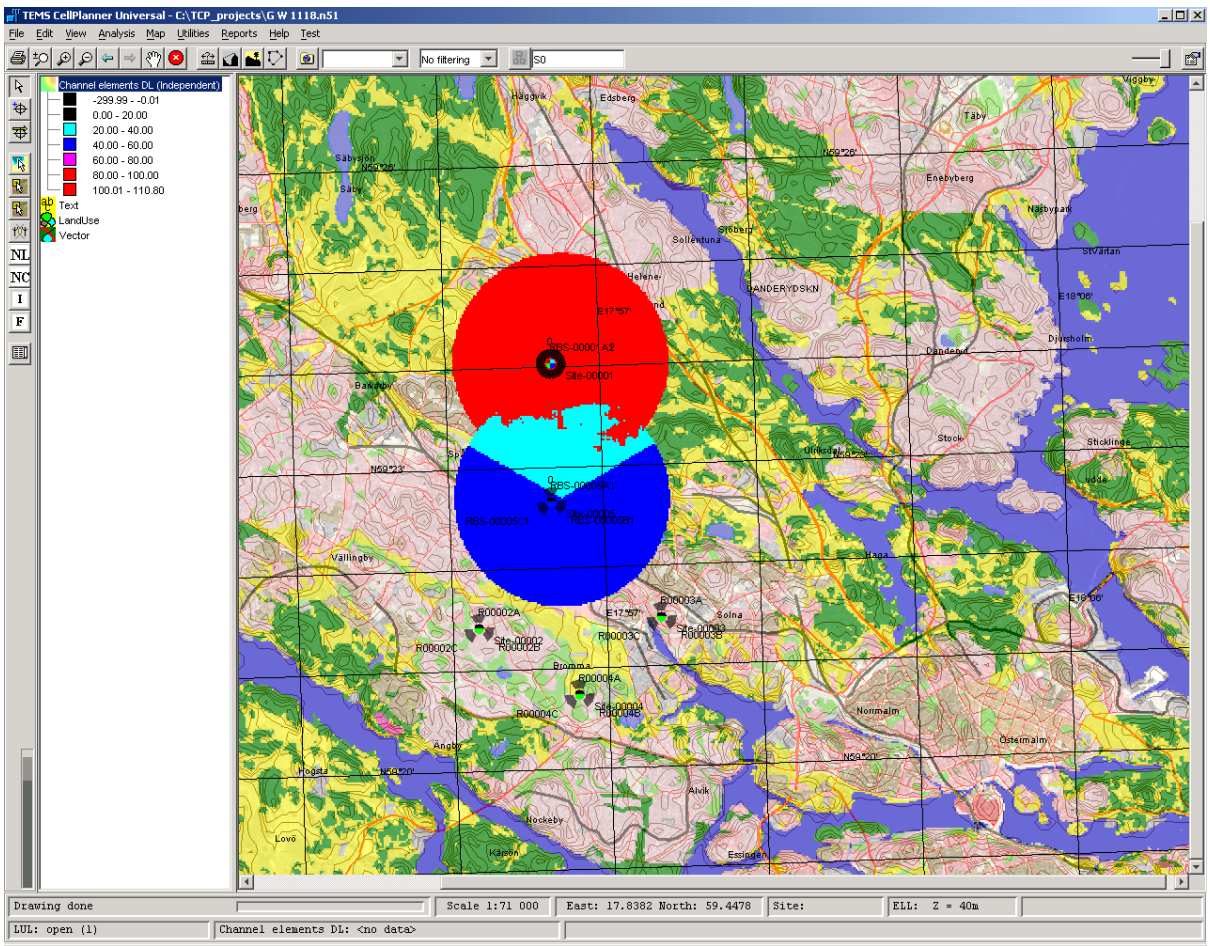
The DL Channel Element plot shows the channel elements required for the cell to satisfy the traffic demand on the downlink. The best server coverage area of every cell is color coded according to the average number of DL channel elements required by the cell. If two or more cells with different carriers have the same best server coverage area, only one cell is shown.

When the application calculates the required number of DL channel elements for the cells for a connection that involves cells in soft and/or softer handover, the application assigns DL channel elements to all the cells.

This plot is available only when Monte Carlo analysis has been run.

Example Plot

The following example shows the DL Channel Element plot:



DL Load

The DL Load plot displays downlink loading for a cell. Downlink loading is defined as the ratio between the total transmitter power required for all connections and the maximum power limit:

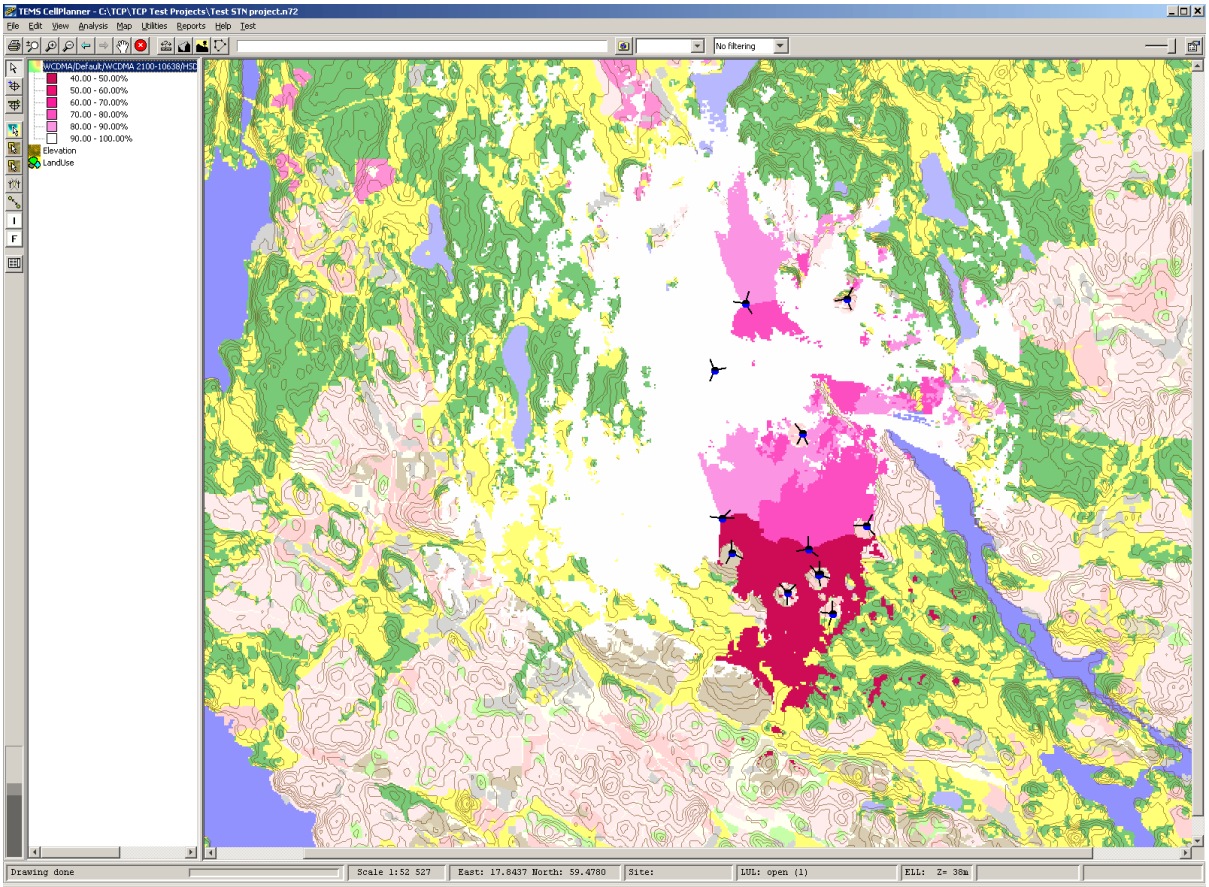
$$P_{loadDL} = \frac{P_{totDL}}{P_{tot\,max\,DL}} \cdot 100\%$$

The DL load is color coded for every cell. The value includes the power of all bearers and common channels on the selected WCDMA carrier, so it is bearer independent.

The parameter is called DL Loading in the WCDMA statistics report.

Example Plot

The following example shows the DL Load plot:



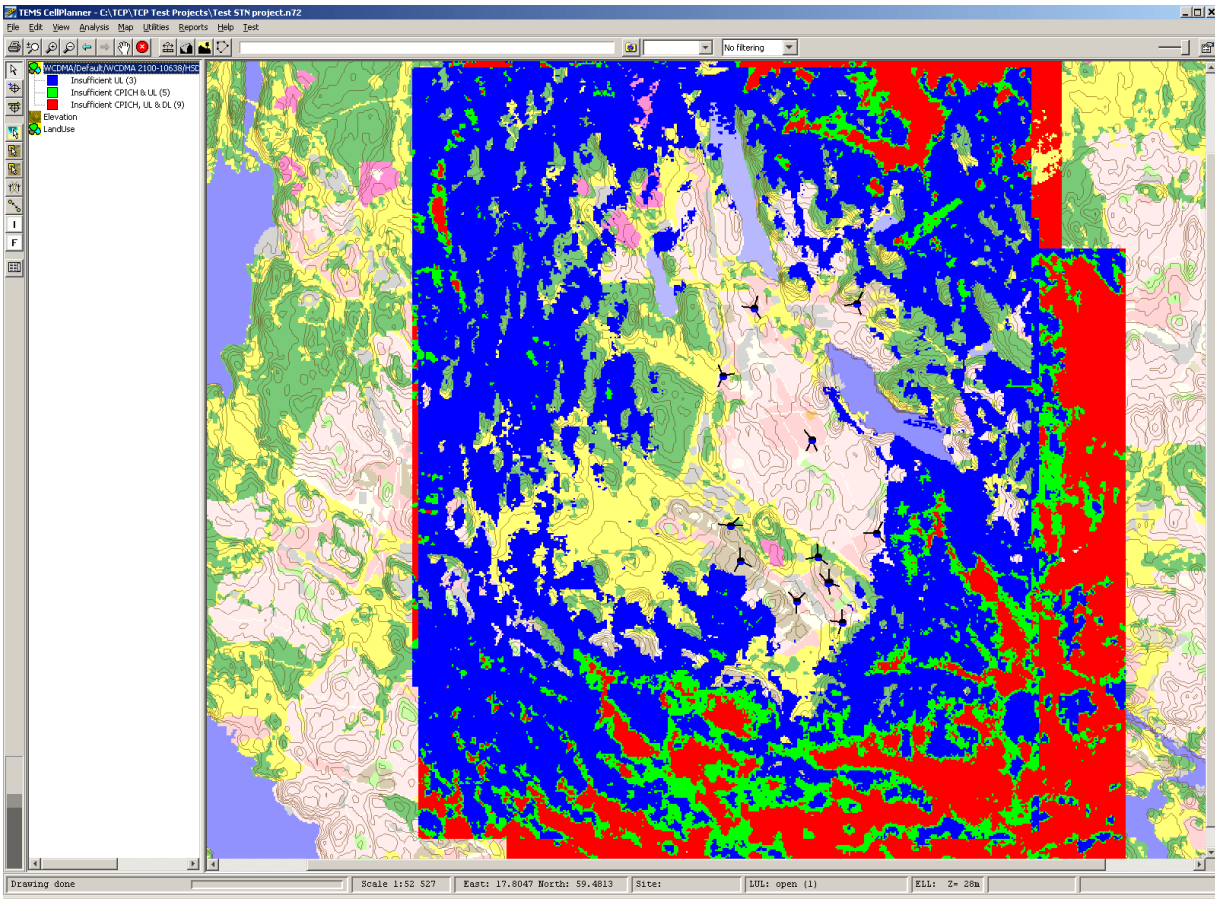
Error Codes

The Error Codes plot shows the reason that a specific bin does not have coverage. Three main reasons exist for lack of coverage, and the error codes represent any combination of the following:

- Insufficient CPICH, UL & DL
- Insufficient UL & DL
- Insufficient CPICH & DL
- Insufficient CPICH & UL
- Insufficient DL
- Insufficient UL
- Insufficient CPICH

Example Plot

The following example shows the Error Codes plot:



Frequency Reuse DL

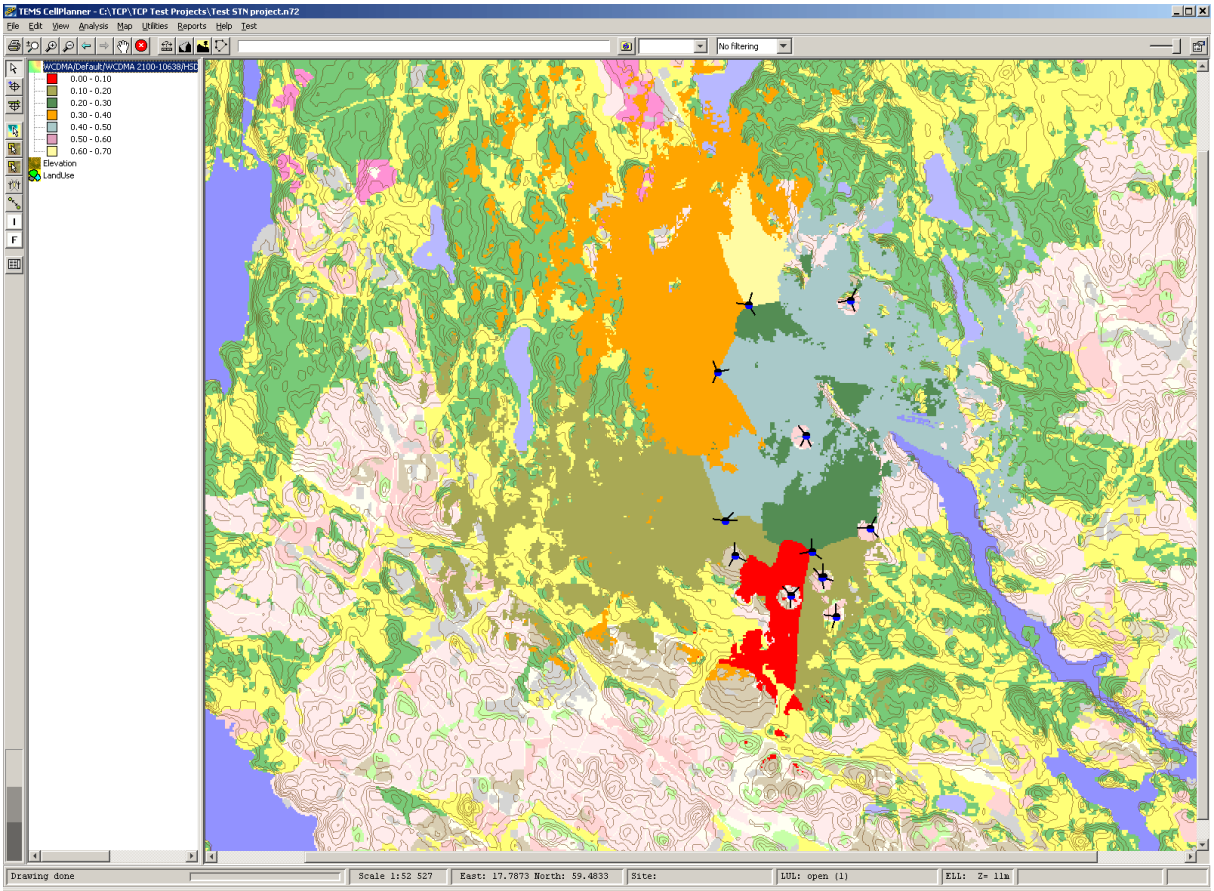
The Frequency Reuse DL plot shows the average over the subscribers (indexed by i) served by a certain cell, the relation between the amount of interference originating from other cells, and the amount of interference originating in the best serving cell. N is the number of subscribers with this best serving cell. The DL frequency reuse efficiency for a cell is calculated as:

$$F_{DL} = \sum_{i} \frac{I_{other,i}}{I_{own,i}} / N$$

The transmitter power includes all bearers and common channels on the selected WCDMA carrier, so the plot is bearer independent. The value is displayed, color coded for every cell.

Example Plot

The following example shows the Frequency Reuse DL plot:



Frequency Reuse UL

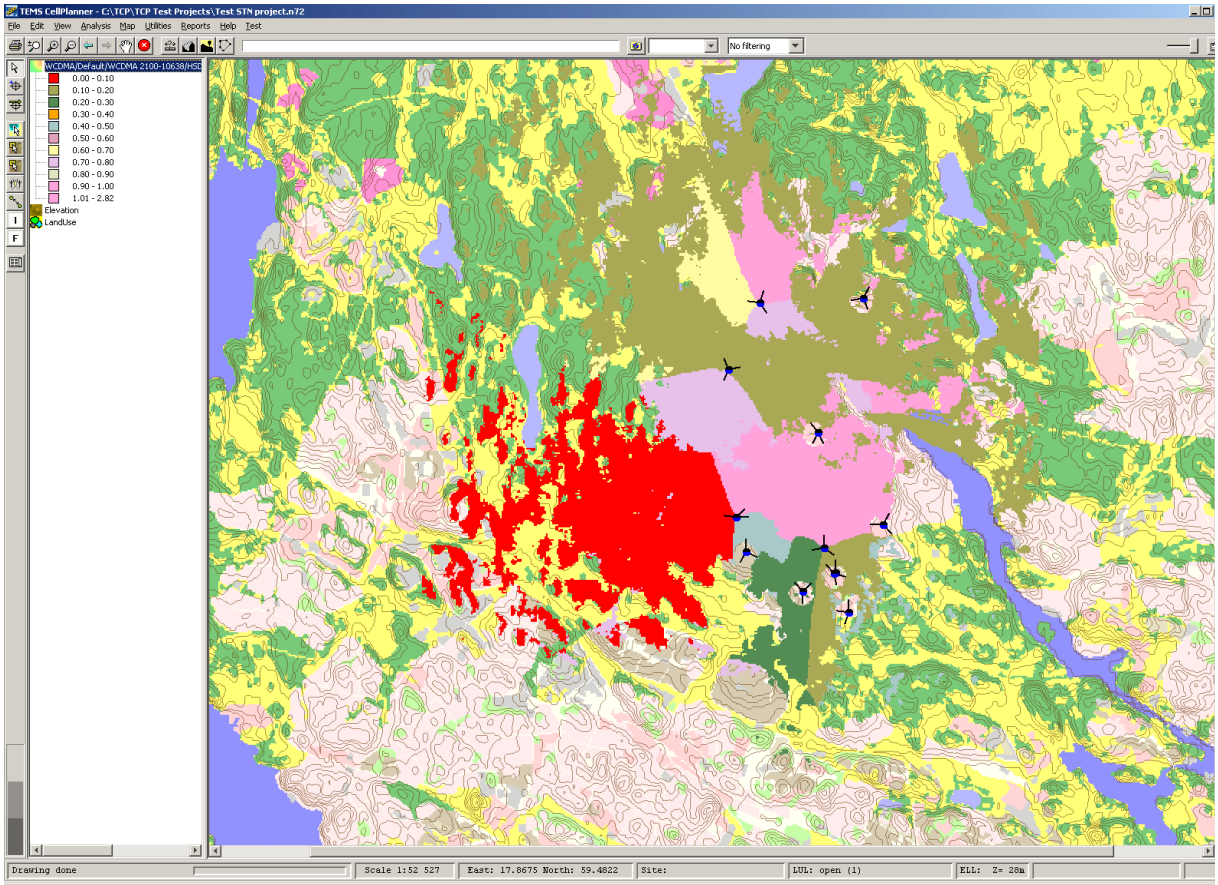
The Frequency Reuse UL plot shows the relation between the amount of interference originating from subscribers in other cells, and the amount of interference originating from subscribers in the own cell, where own cell equals the best serving cell. UL frequency reuse efficiency for a cell is calculated as:

$$F_{UL} = \frac{I_{other}}{I_{own}}$$

The value is calculated as an average over the subscribers using all bearers on the selected WCDMA carrier, so the F-value is bearer independent. The F-value is displayed, color coded for every cell.

Example Plot

The following example shows the Frequency Reuse UL plot:



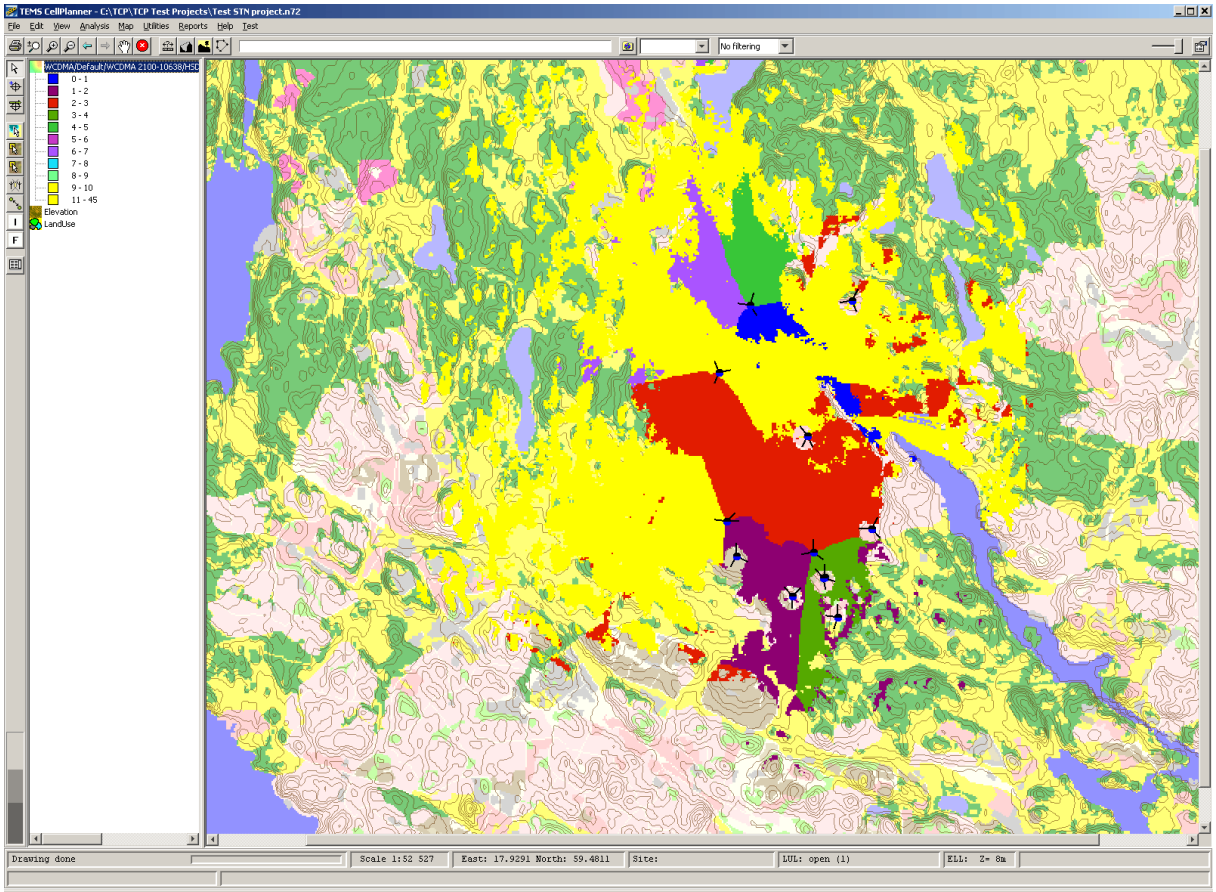
Users Blocked at Sector

The Users Blocked at Sector plot, color coded for every cell, shows the number of subscribers, using the selected bearer, that could not be connected to the cell on the selected WCDMA carrier.

The parameter is called Users Blocked in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector plot:



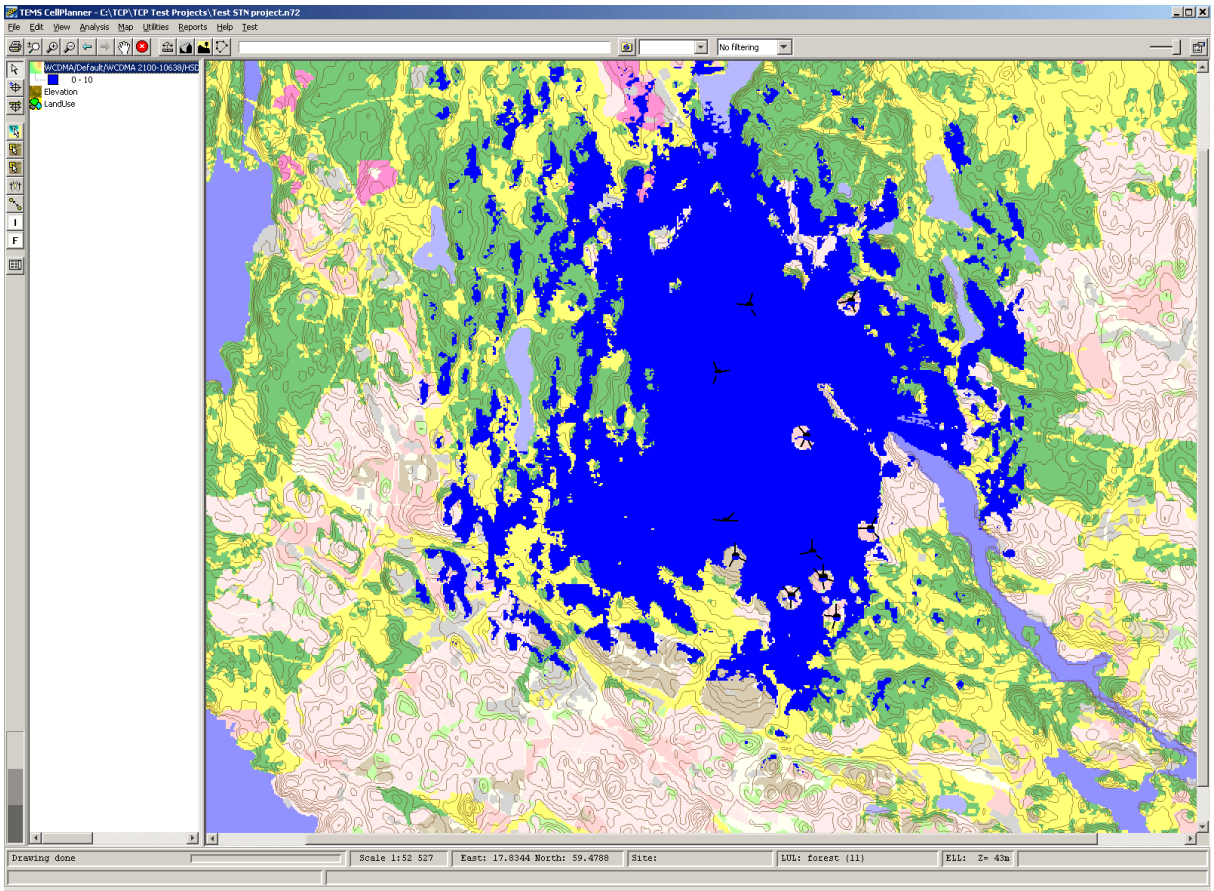
Users Blocked at Sector Due to DL ASE Limit

The Users Blocked at Sector Due to DL ASE Limit plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the upper limit on the number of DL ASEs in the cell. When the application calculates the total number of DL ASEs for the cells for a connection that involves cells in soft and/or softer handover, the program assigns DL ASEs to all the cells.

The parameter is called Overloaded DL ASEs in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to DL ASE Limit plot:



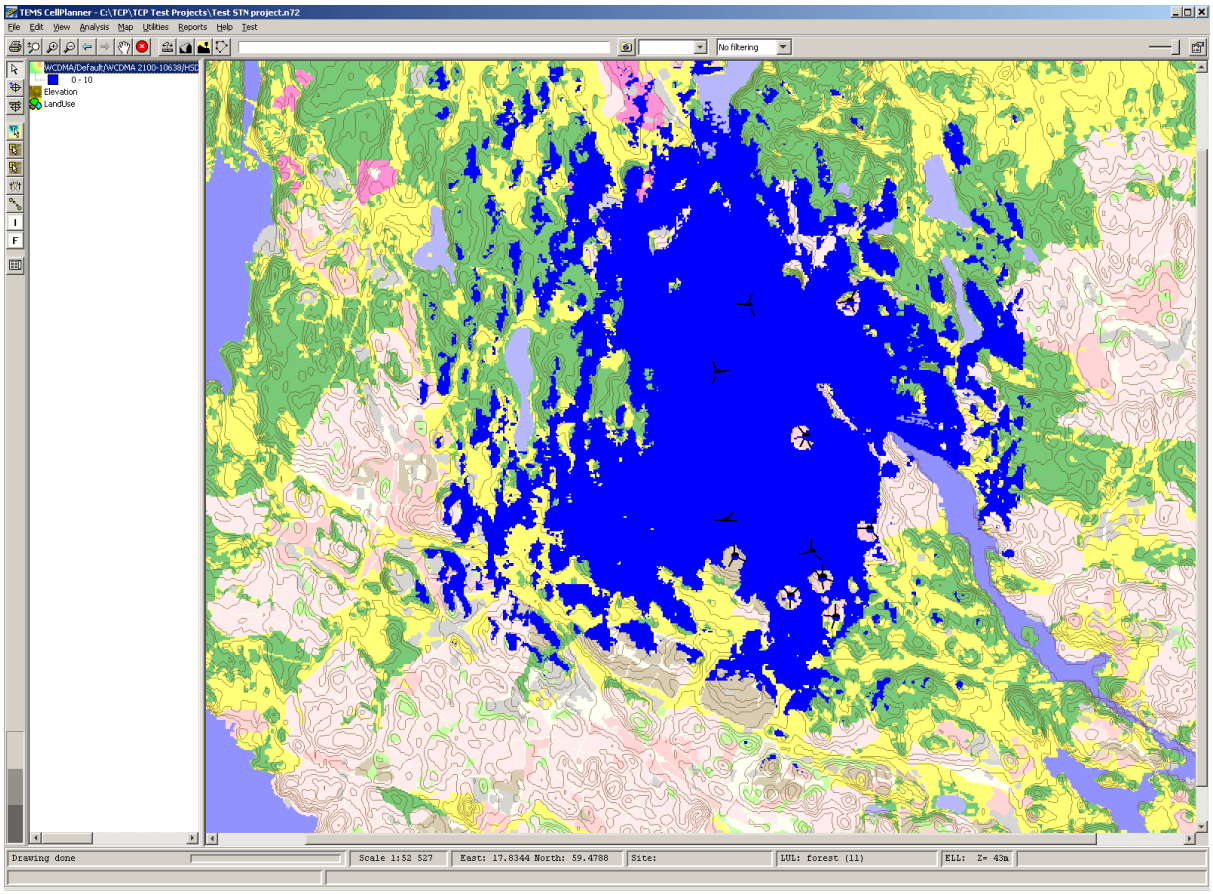
Users Blocked at Sector Due to DL Service Power

The Users Blocked at Sector Due to DL Service Power plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the upper limit on the total DL power of the cell.

The parameter is called Overloaded DL in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to DL Service Power plot:



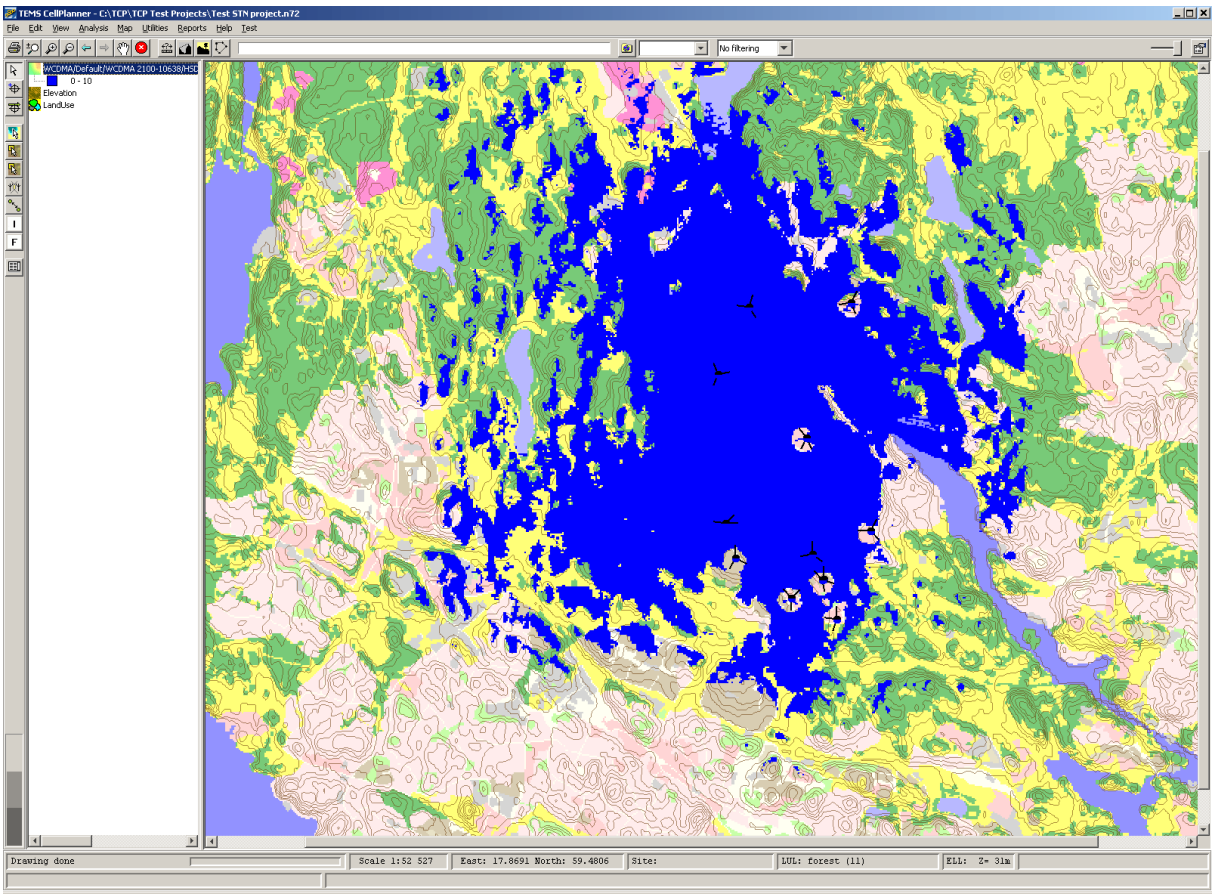
Users Blocked at Sector Due to UL ASE Limit

The Users Blocked at Sector Due to UL ASE Limit plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the upper limit on the number of UL ASEs in the cell. When the application calculates the total number of UL ASEs for the cells, then for a connection that involves cells in soft and/or softer handover, it assigns UL ASEs to all the cells, but the number is divided by the number of cells in handover.

The parameter is called Overloaded UL ASEs in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to UL ASE Limit plot:



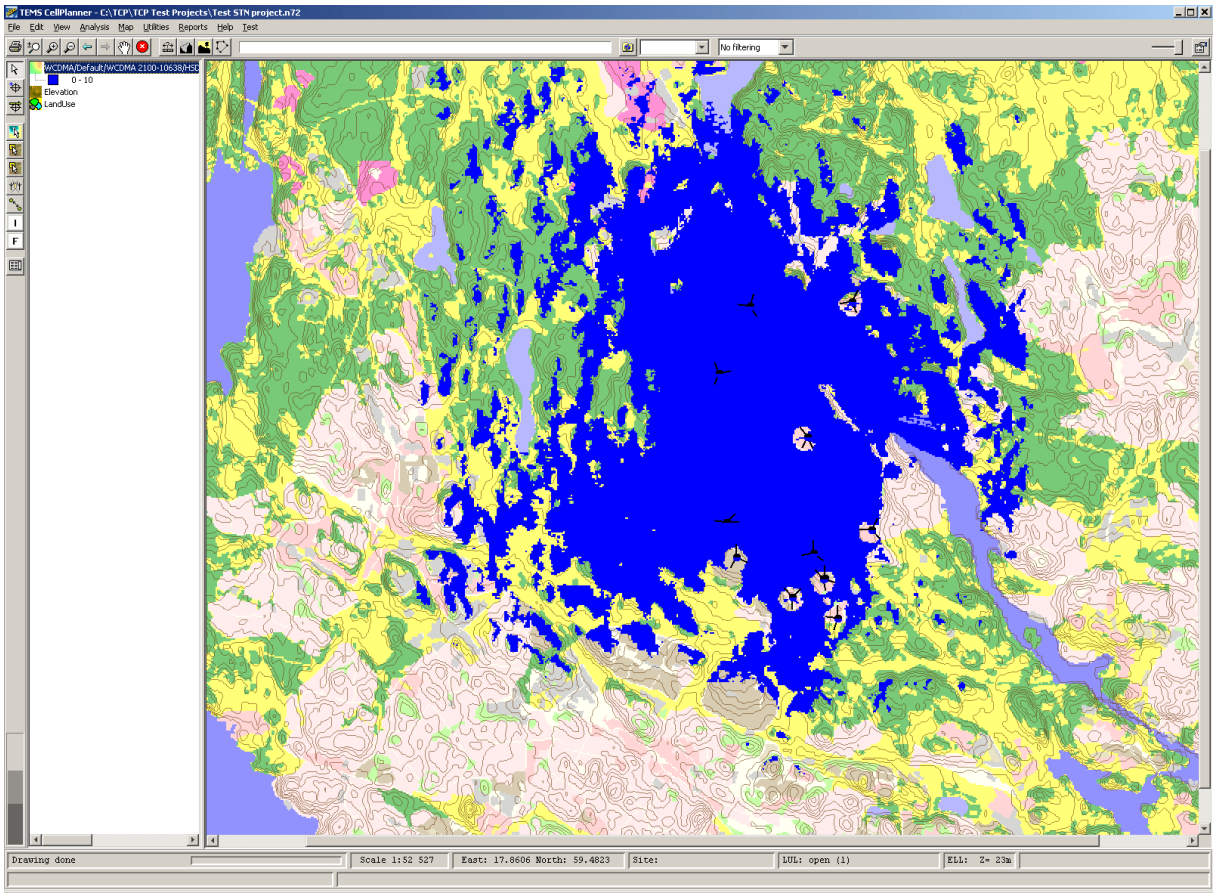
Users Blocked at Sector Due to High UL Interference

The Users Blocked at Sector Due to High UL Interference plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the upper limit on the UL noise rise.

The parameter is called Overloaded Interference in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to High UL Interference plot:



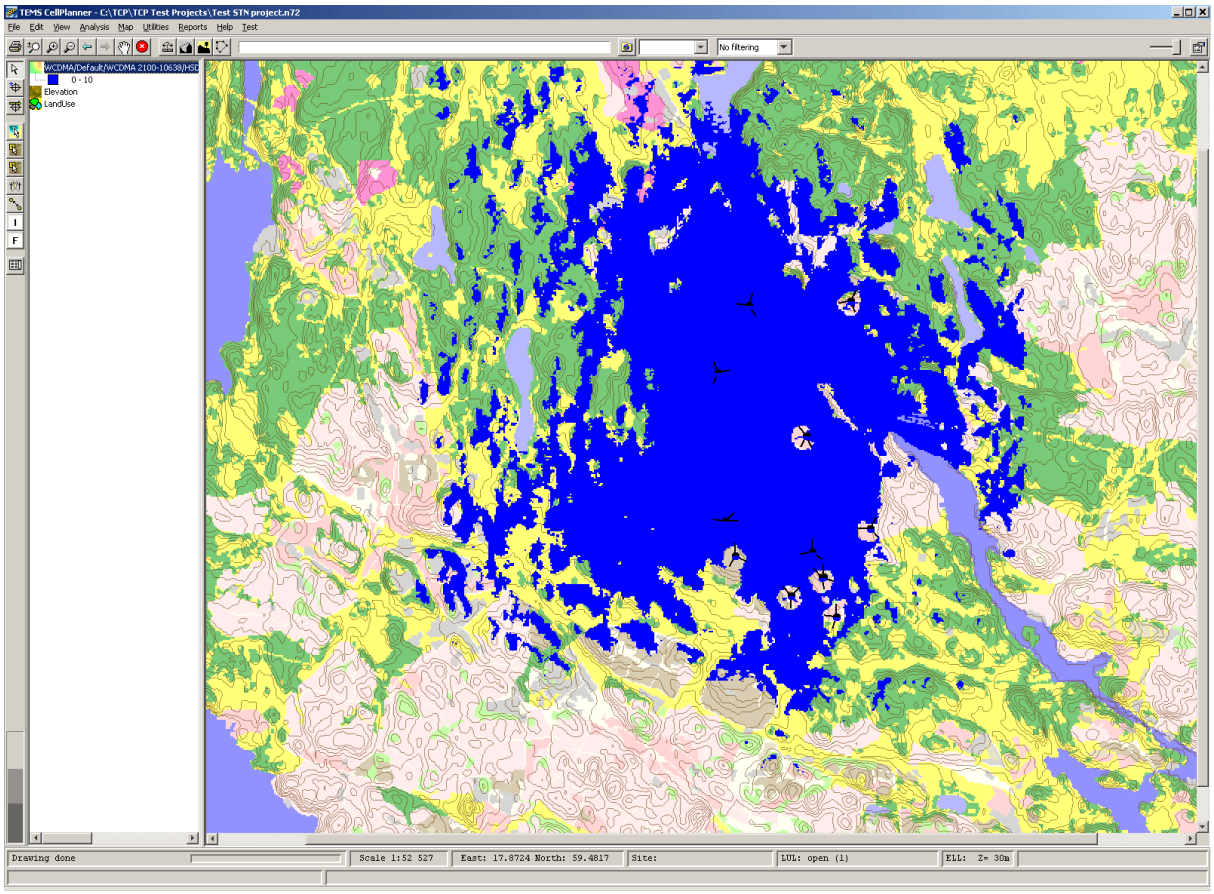
Users Blocked at Sector Due to Max DL Power

The Users Blocked at Sector Due to Max DL Power plot, color coded for every cell, shows the number of subscribers, using the selected bearer, that could not be connected on the selected WCDMA carrier due to the upper limit on the DL link power. The fade margin M_{link}DL dB is considered.

The parameter is called Insufficient DL in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to Max DL Power plot:



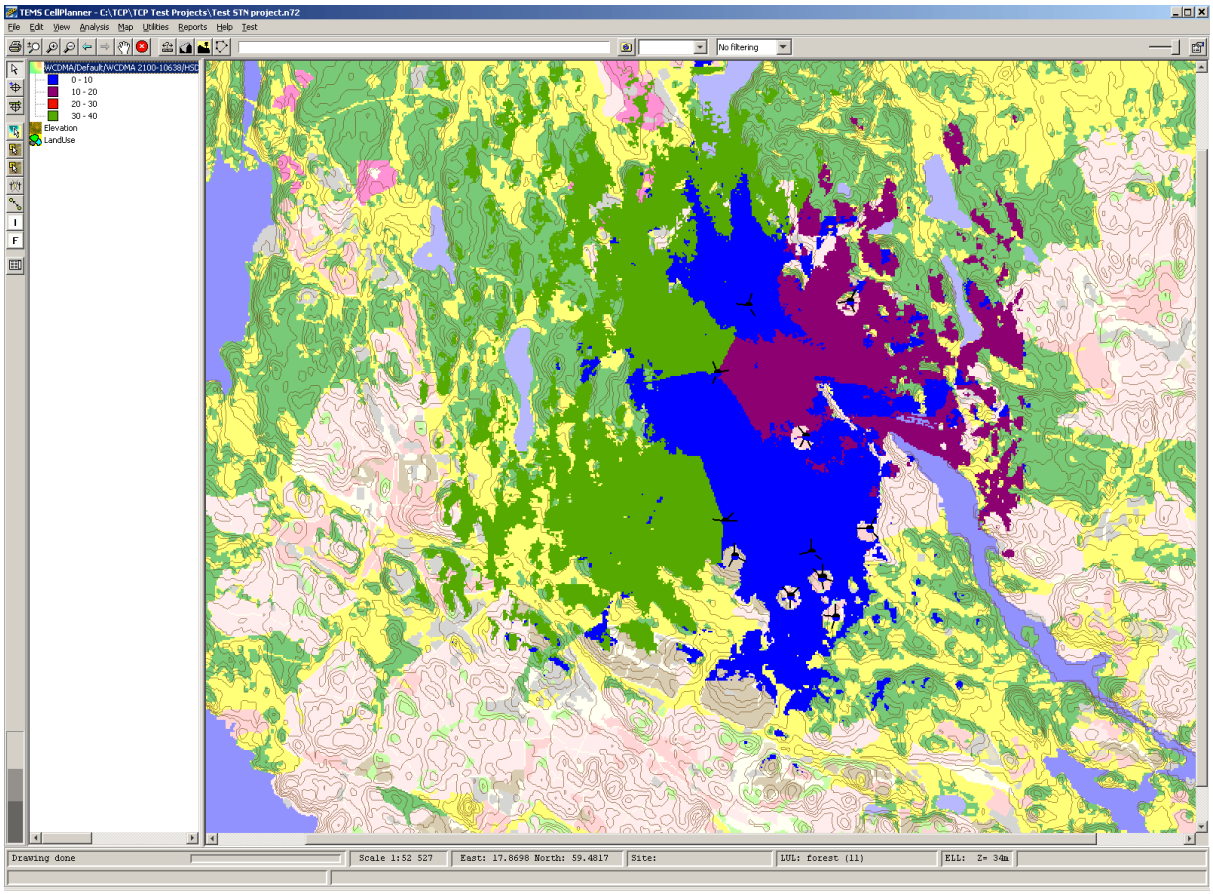
Users Blocked at Sector Due to Max UL Power

The Users Blocked at Sector Due to Max UL Power plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the upper limit on the mobile transmitter power. The fade margin M_{link}dB is considered.

The parameter is called Insufficient UL in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to Max UL Power plot:



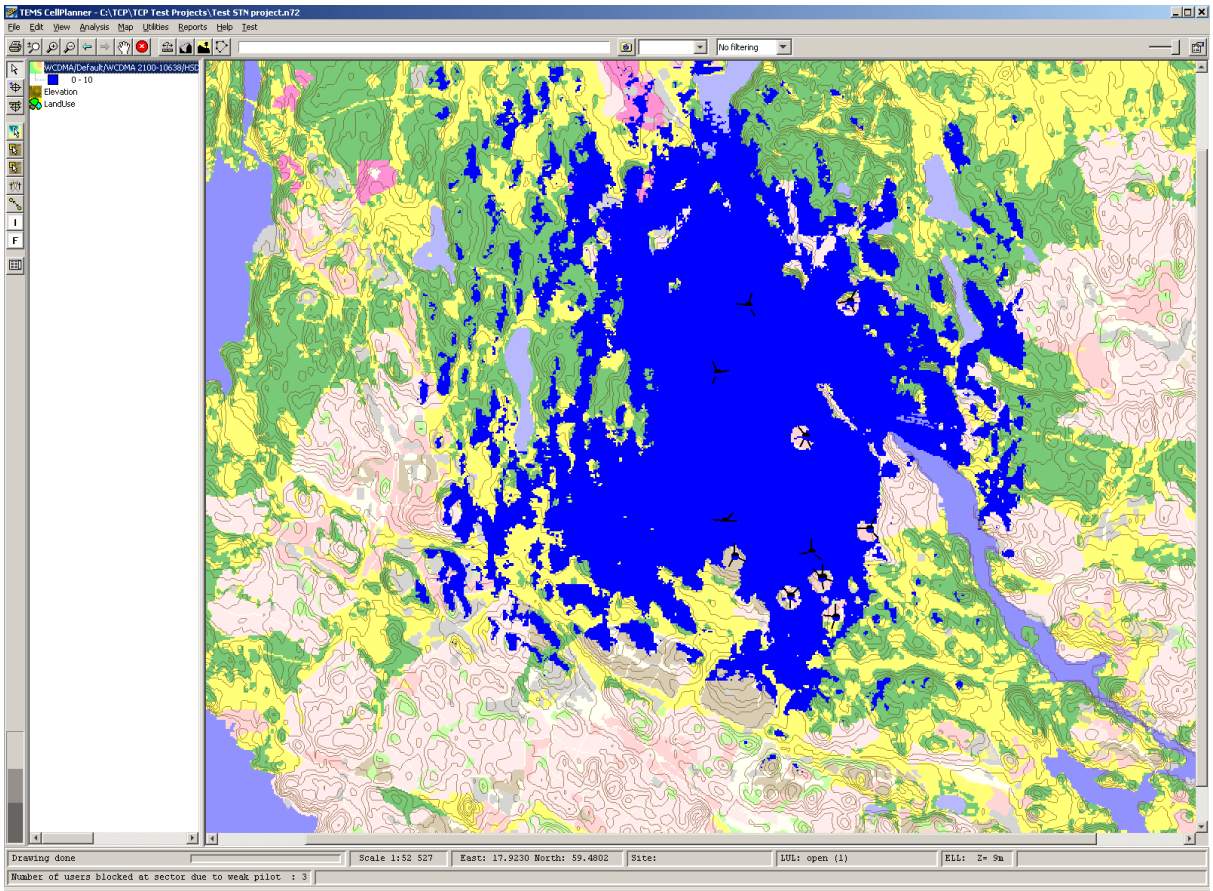
Users Blocked at Sector Due to Weak Pilot

The Users Blocked at Sector Due to Weak Pilot plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be connected on the selected WCDMA carrier due to the minimum required CPICH quality. The fade margin M_{link}dB is taken into account.

The parameter is called Insufficient CPICH in the WCDMA statistics report.

Example Plot

The following example shows the Users Blocked at Sector Due to Weak Pilot plot:

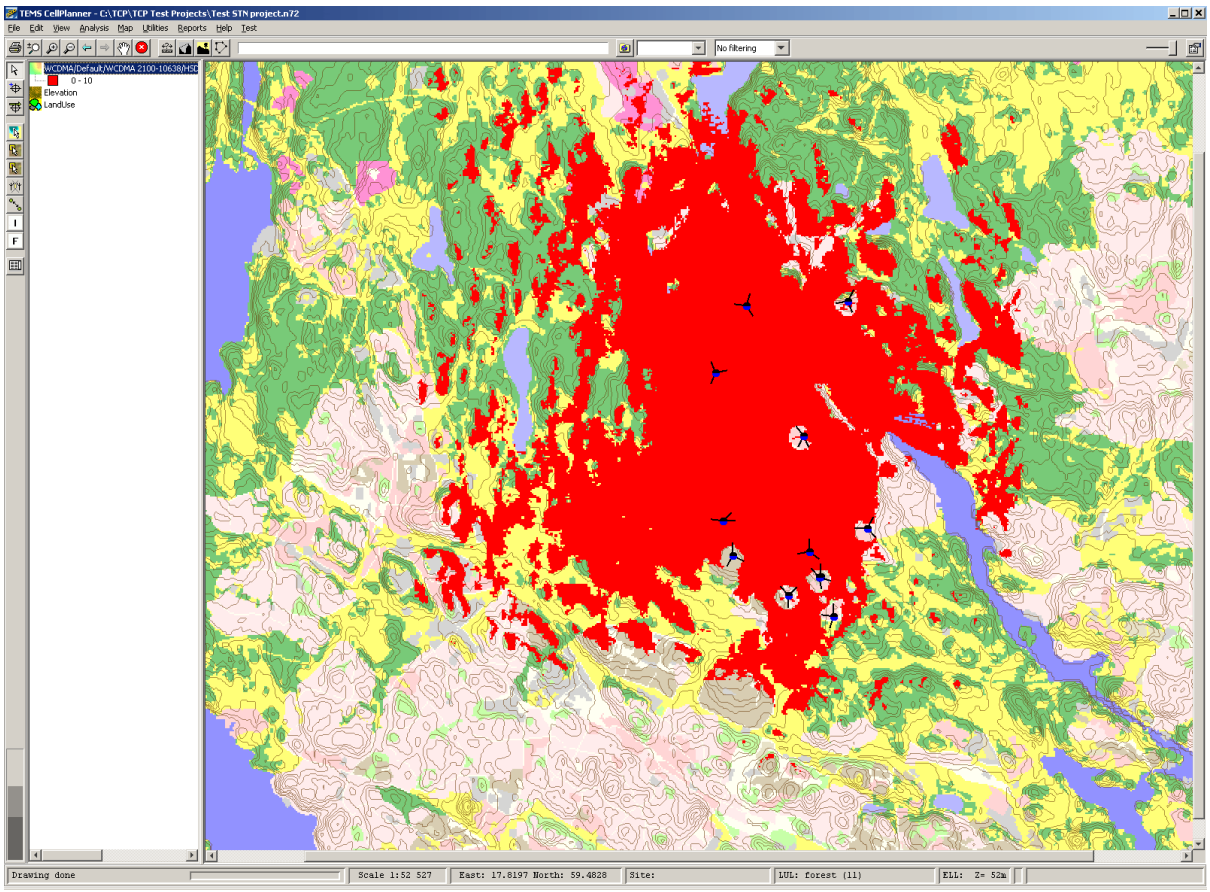


Number of Users in Soft Handover

The Number of Users in Soft Handover plot shows the number of subscribers that are served in soft handover, color coded for every cell. A subscriber that is in soft handover with two or more cells is counted in all those cells.

Example Plot

The following example shows the Number of Users in Soft Handover plot:



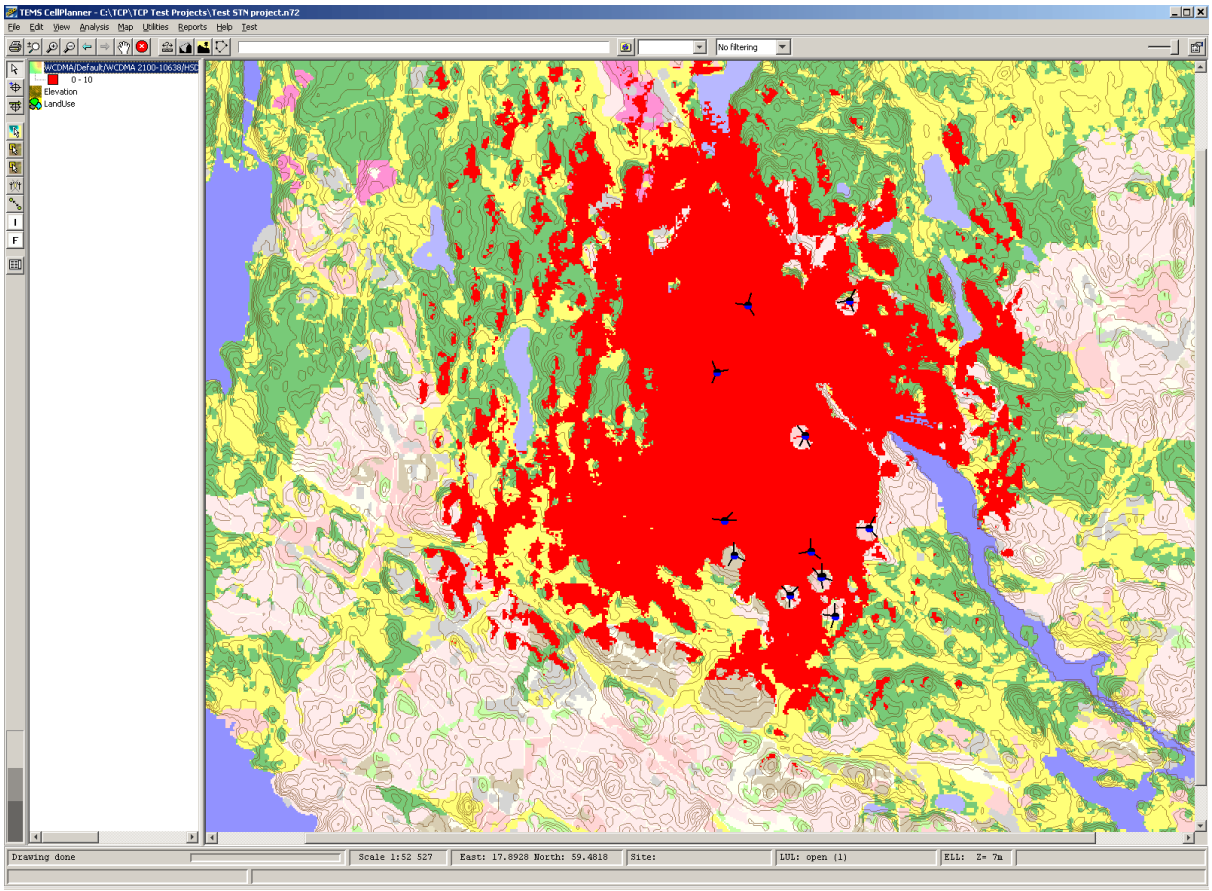
Number of Users in Soft-Softer Handover

The Number of Users in Soft-Softer Handover plot shows the number of subscribers that are served in soft-softer handover, color coded for every cell. A subscriber that is in soft-softer handover with three cells will be counted in all three cells.

The parameter is not included in the WCDMA statistics report.

Example Plot

The following example shows the Number of Users in Soft-Softer Handover plot:



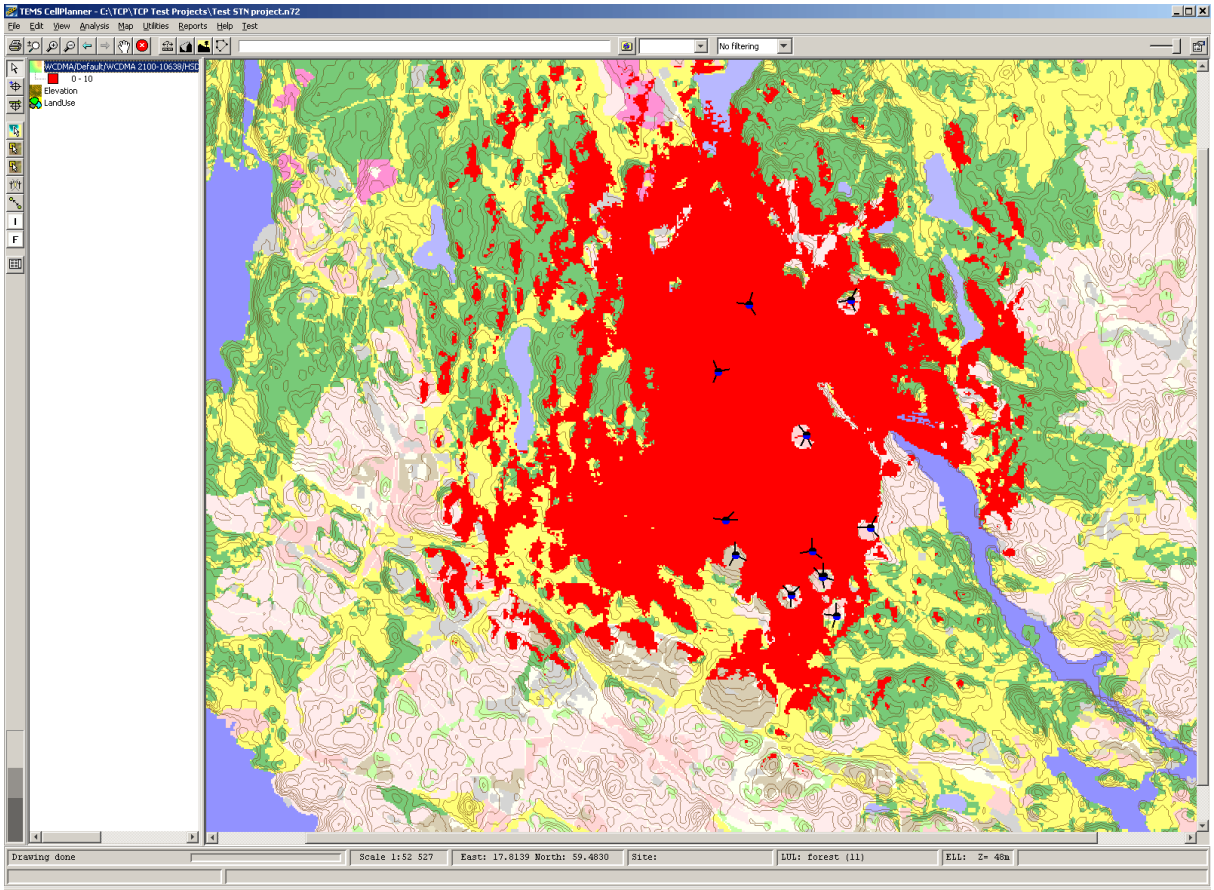
Number of Users in Softer Handover

The Number of Users in Softer Handover plot shows the number of subscribers that are served in softer handover, color coded for every cell. A subscriber that is in softer handover with two or more cells will be counted in all those cells.

The parameter is not included in the WCDMA statistics report.

Example Plot

The following example shows the Number of Users in Softer Handover plot:



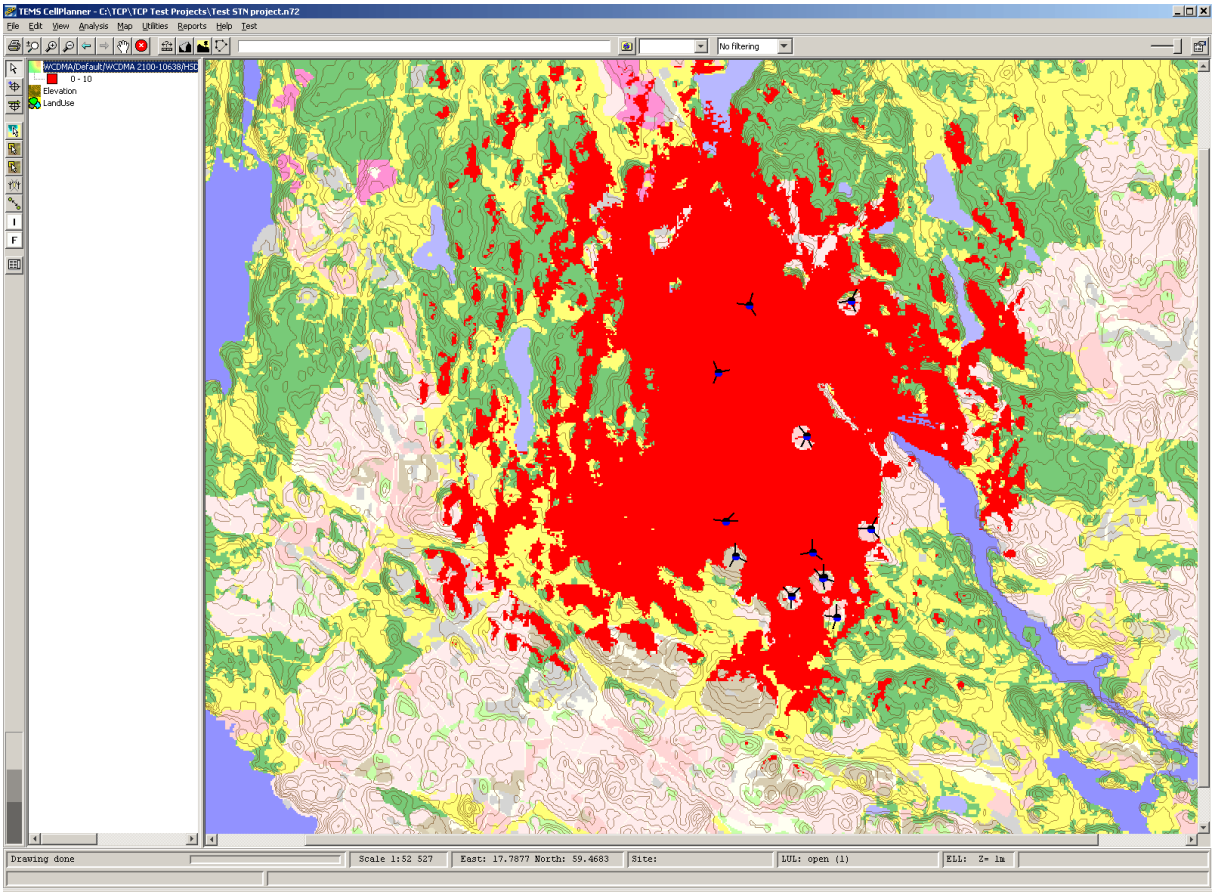
Users Served at Fallback Rate DL

The Users Served at Fallback Rate DL plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be served at peak data rate in the downlink, but could be admitted at a lower (fallback) data rate.

The parameter is called Admitted at Fallback DL in the WCDMA statistics report.

Example Plot

The following example shows the Users Served at Fallback Rate DL plot:



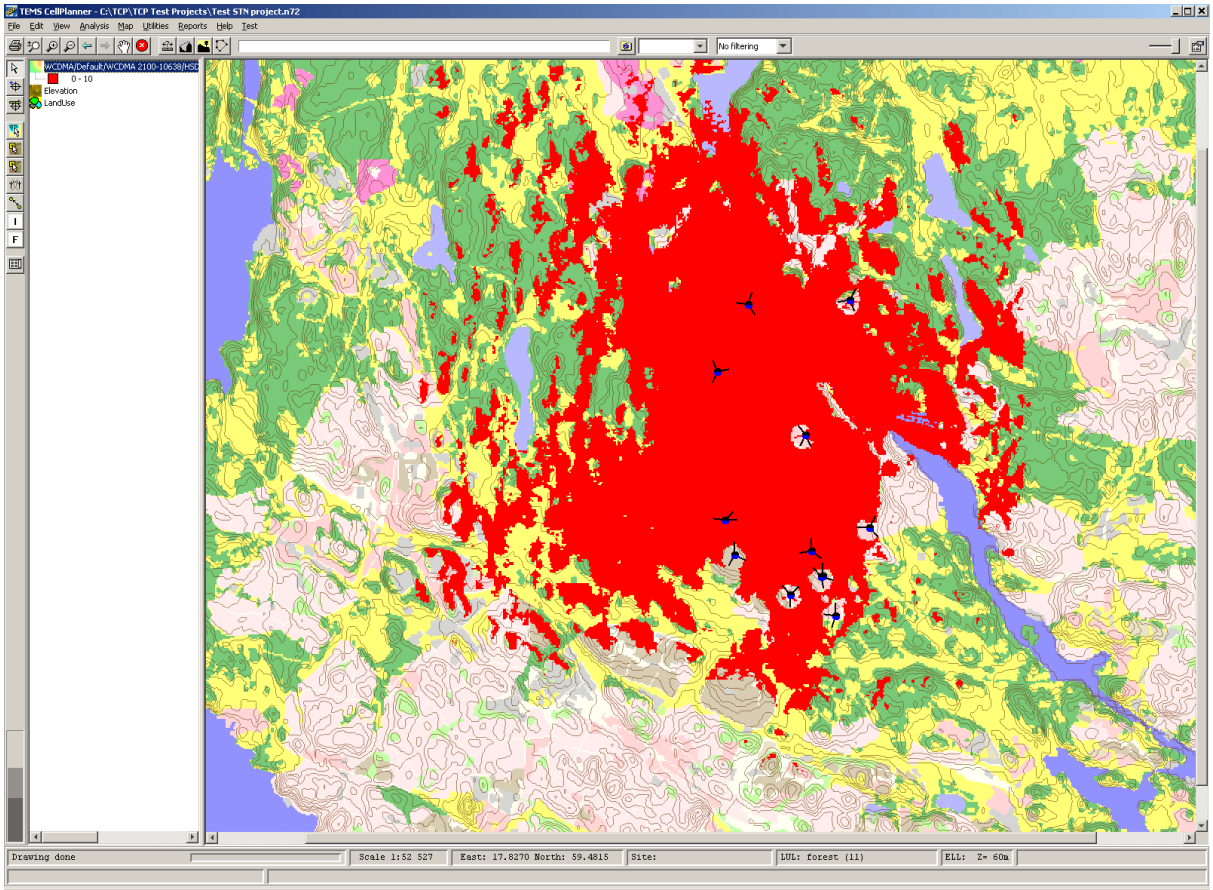
Users Served at Fallback Rate UL

The Users Served at Fallback Rate UL plot, color coded for every cell, shows the number of subscribers using the selected bearer that could not be served at peak data rate in the uplink, but could be admitted at a lower (fallback) data rate.

The parameter is called Admitted at Fallback UL in the WCDMA statistics report.

Example Plot

The following example shows the Users Served at Fallback Rate UL plot:



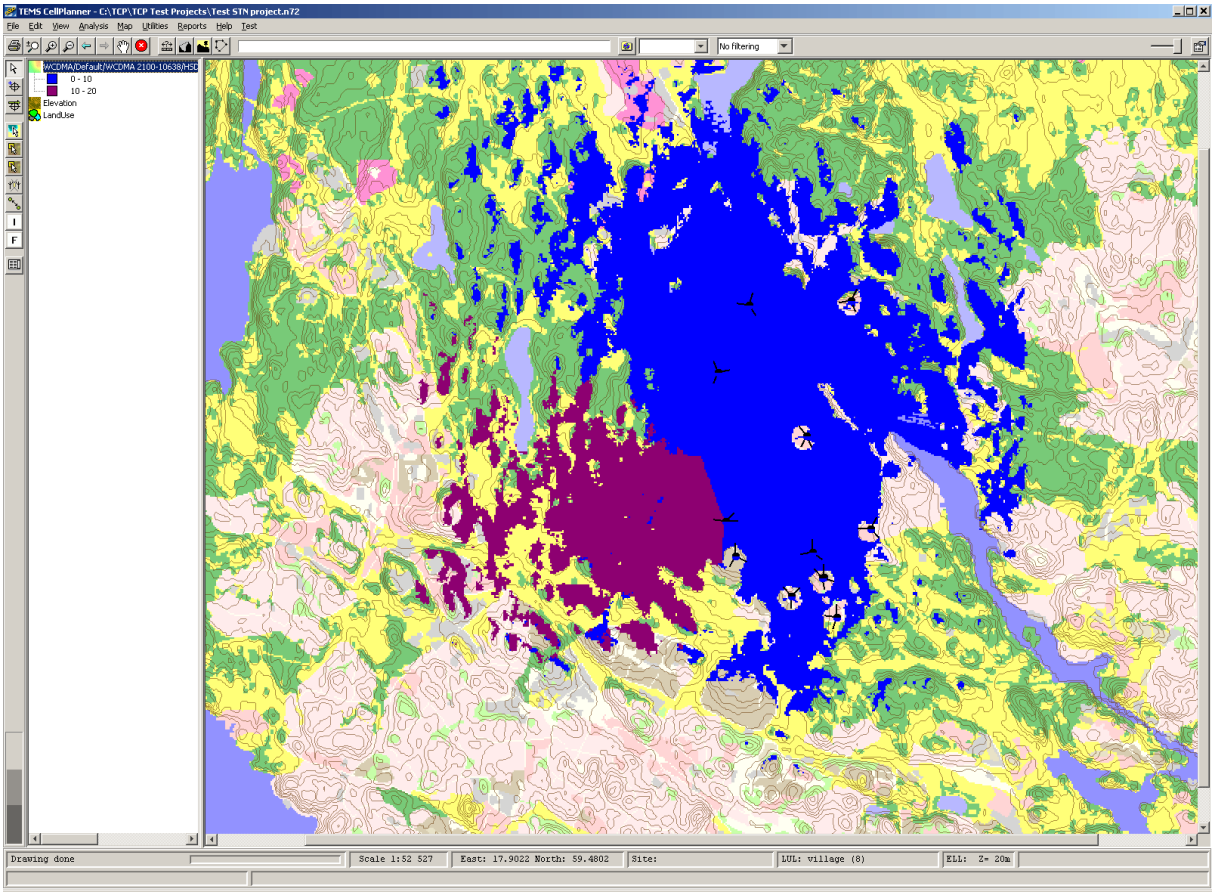
Users Served at Peak Rate DL

The Users Served at Peak Rate DL plot, color coded for every cell, shows the number of subscribers using the selected bearer that were admitted at peak data rate in the downlink.

The parameter is called Admitted at Peak DL in the WCDMA statistics report.

Example Plot

The following example shows the Users Served at Peak Rate DL plot:



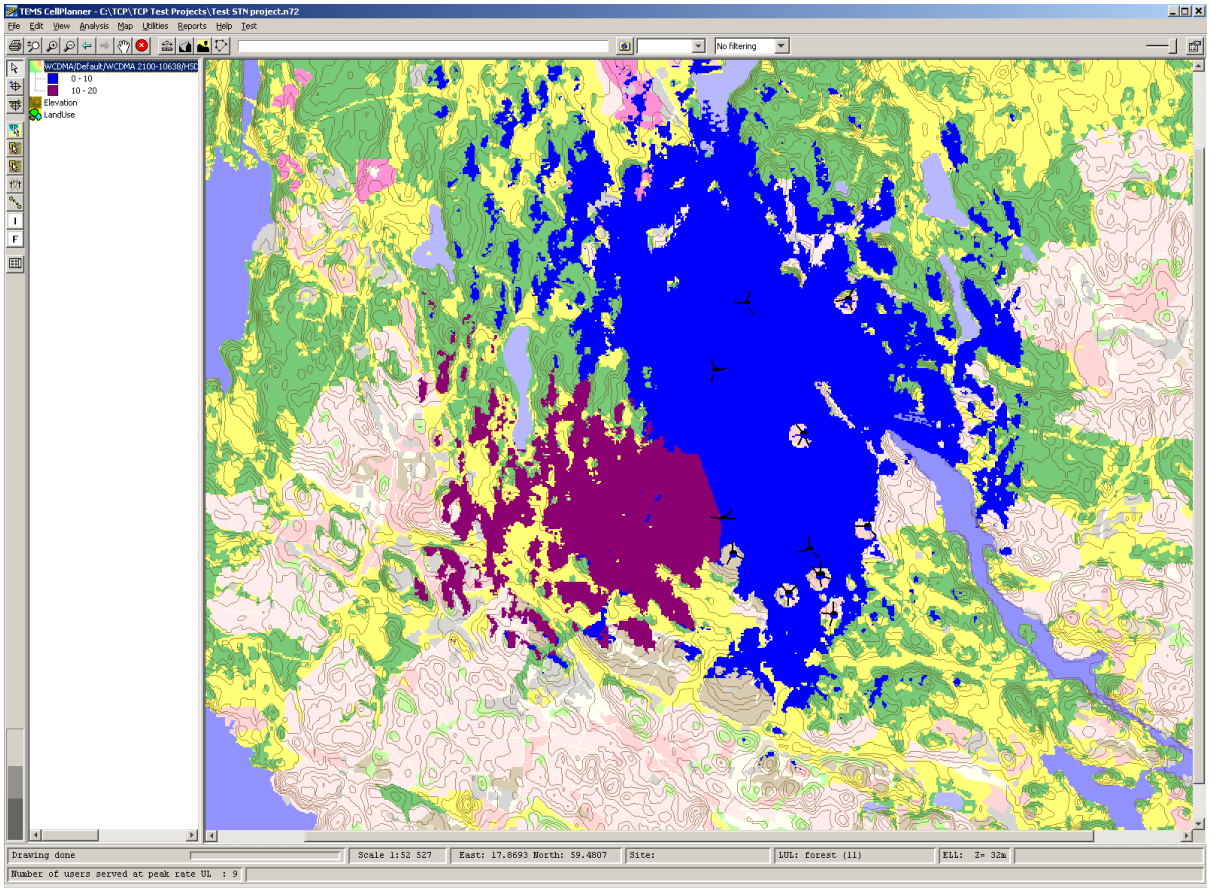
Users Served at Peak Rate UL

The Users Served at Peak Rate UL plot, color coded for every cell, shows the number of subscribers using the selected bearer that were admitted at peak data rate in the uplink.

The parameter is called Admitted at Peak UL in the WCDMA statistics report.

Example Plot

The following example shows the Users Served at Peak Rate UL plot:



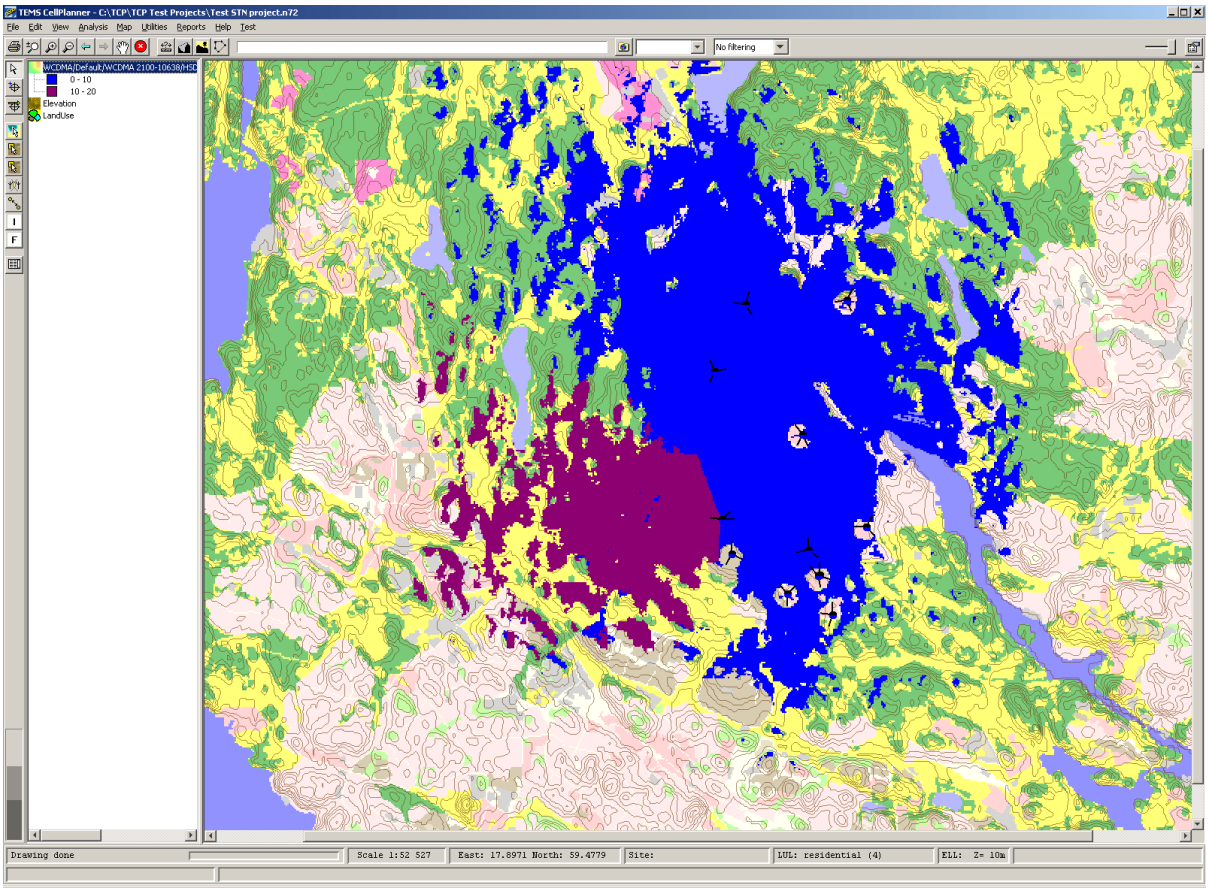
Users Served at Sector

The Users Served at Sector plot, color coded for every cell, shows the number of subscribers using the selected bearer that could be connected to the cell on the selected WCDMA carrier. A subscriber that is in handover with two or more cells is counted in all those cells.

The parameter is called Users Served in the WCDMA statistics report.

Example Plot

The following example shows the Users Served at Sector plot:



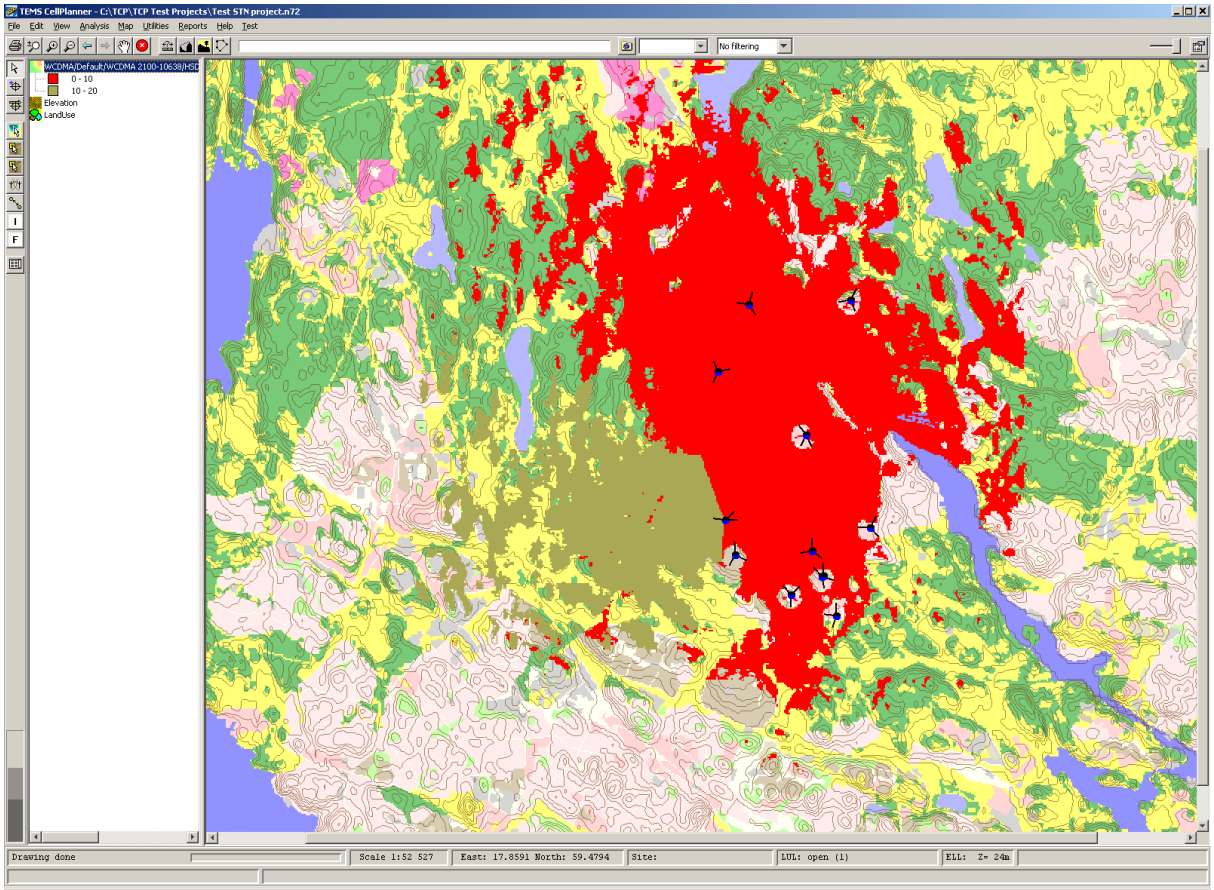
Users Served Only by this Cell

The Users Served Only by this Cell plot shows the number of subscribers that are served exclusively by one cell (that is, not in handover), color coded for every cell.

The parameter is not included in the WCDMA statistics report.

Example Plot

The following example shows the Users Served Only by this Cell plot:

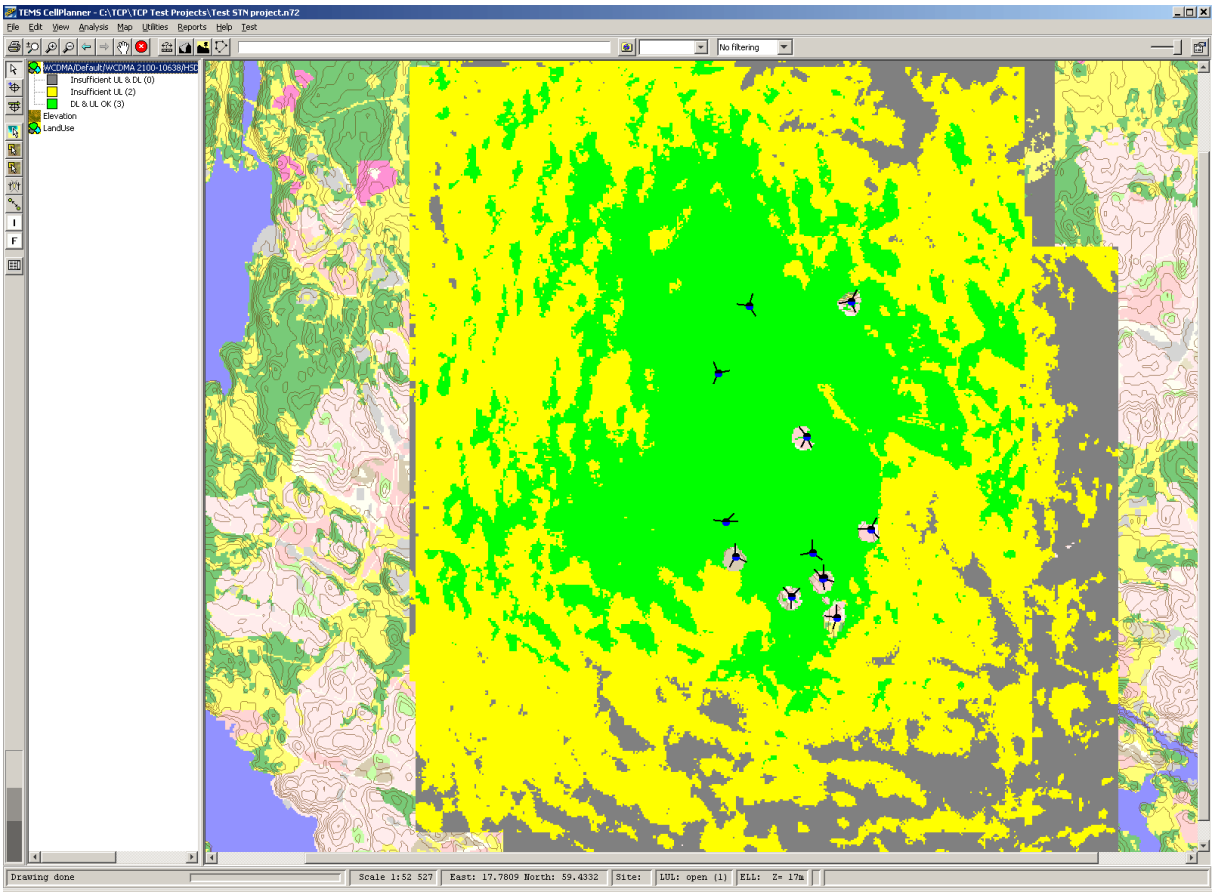


Path Balance

The Path Balance plot indicates, by means of different colors, bins satisfying coverage on both uplink and downlink, and bins satisfying only one of the coverage criteria: UL link power and DL link power. The status bar also indicates if the criteria are fulfilled or not fulfilled.

Example Plot

The following example shows the Path Balance plot:



UL Channel Element

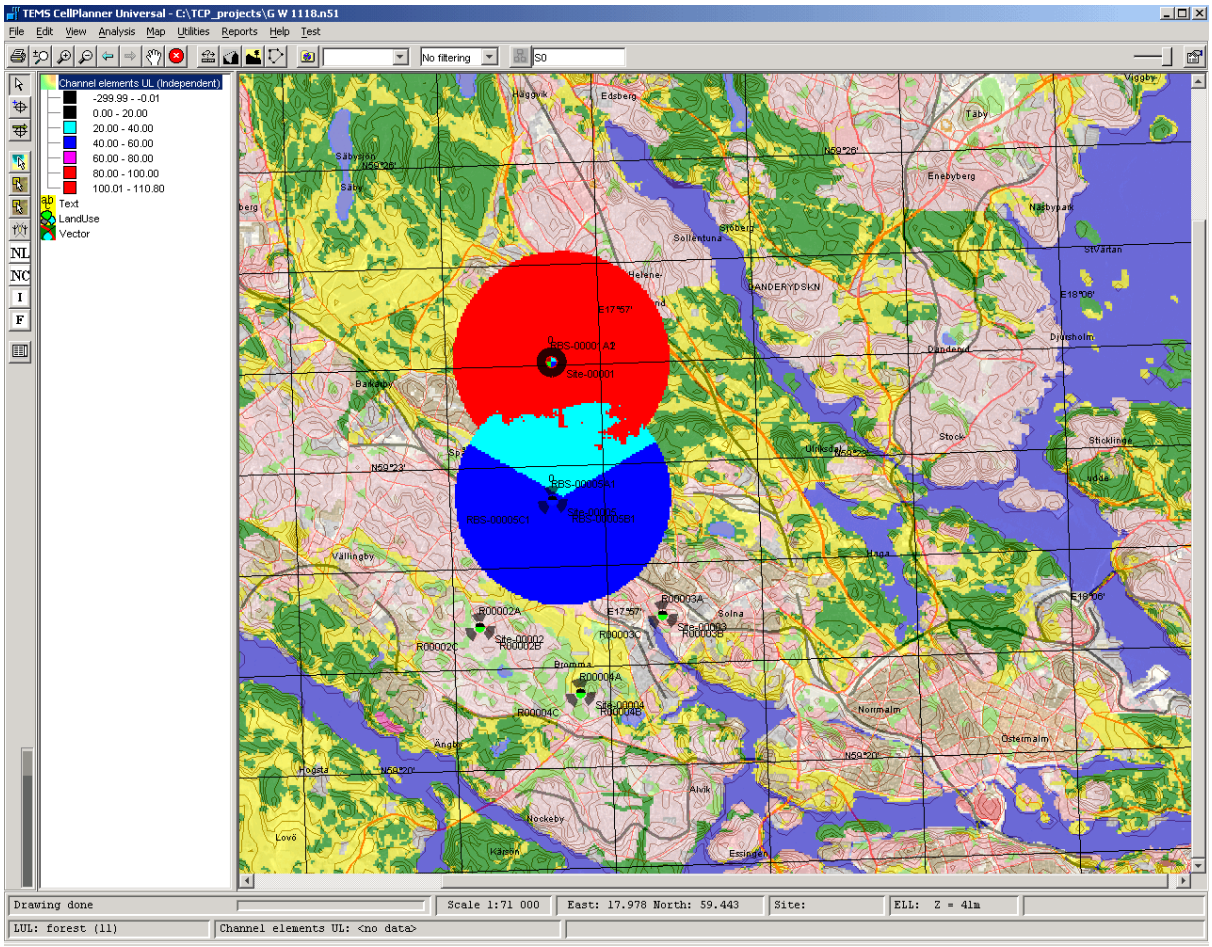
The UL Channel Element plot shows the channel elements required for the cell to satisfy the traffic demand on the uplink. The best server coverage area of every cell is color coded according to the average number of UL channel elements that is needed by the cell. If two or more cells with different carriers have the same best server coverage area, only one cell is shown.

This plot is available only if the Monte Carlo analysis has been run.

When the program calculates the required number of UL channel elements for the cells, then for a connection that involves cells in soft and/or softer handover, the program assigns UL channel elements to all the cells.

Example Plot

The following example shows the UL Channel Element plot:



UL Load

The UL Load plot shows the noise rise seen by the receiver of each cell. The noise rise is based on the received power from all the subscribers surrounding the cell. *Loading* (in %) is calculated as a function of uplink noise rise I_{UL} (in dB):

$$Loading = 1 - 10^{\left(\frac{-I_{UL}}{10}\right)}$$

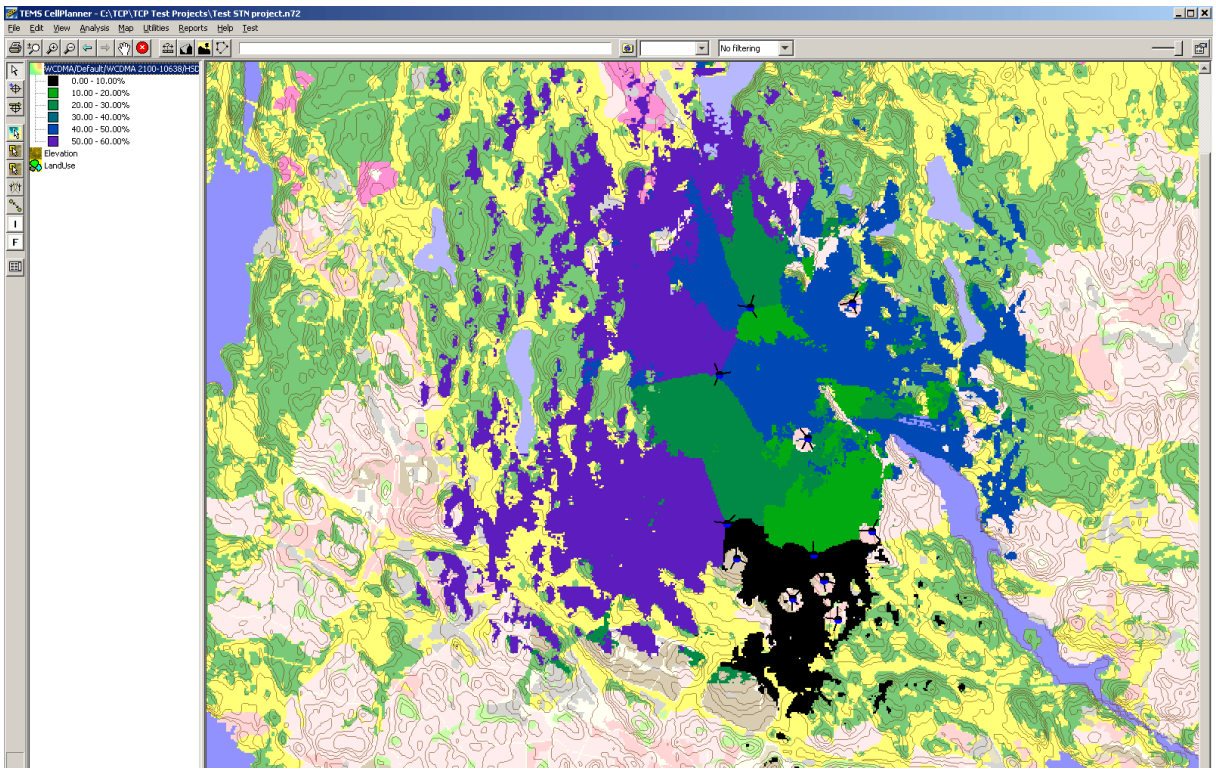
I_{UL} is calculated as the total received WCDMA power plus receiver noise in the RBS (calculated in W and converted into dBm) minus the receiver noise in the RBS (in dBm).

UL loading is color coded for every cell. The value includes the received power from subscribers using all bearers on the selected WCDMA carrier, so it is bearer independent.

The parameter is called UL Loading in the WCDMA statistics report.

Example Plot

The following example shows the UL Load plot:

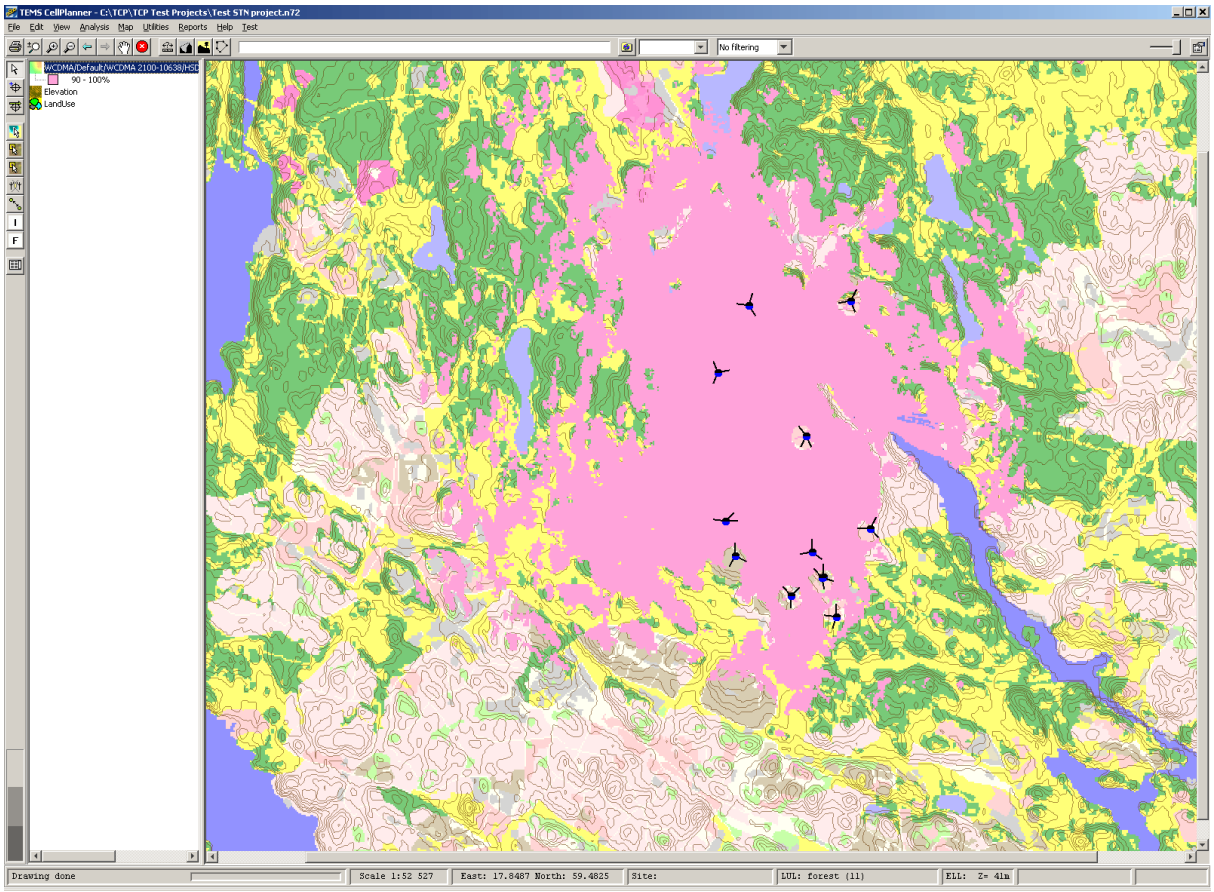


Unused Codes

The Unused Codes plot, color coded for every cell, shows the percentage of the maximum number of orthogonal codes (DL channelization codes) not consumed by subscribers using the selected WCDMA carrier and bearer. The maximum number of orthogonal codes is always assumed to be 256, regardless of the upper limit set in the WCDMA cell. The number of codes consumed by subscribers using other WCDMA bearers on the same carrier is not considered.

Example Plot

The following example shows the Unused Codes plot:



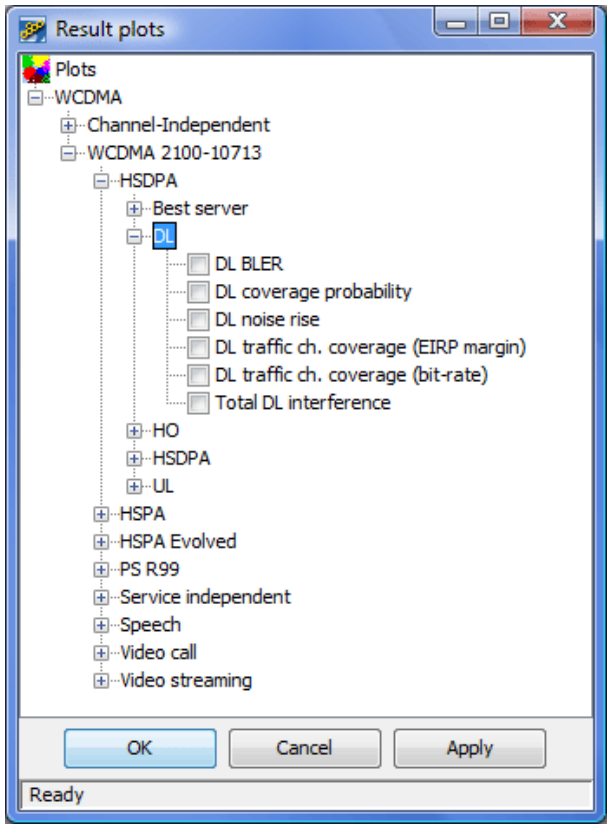
WCDMA DL Plots

The result from WCDMA Analysis with option **DL traffic channel coverage** enabled can be displayed as downlink plots.

The downlink plots listed below can be generated per frequency and service (WCDMA bearer):

- DL Block Error Rate (BLER)
- DL Coverage Probability
- DL Noise Rise
- DL Traffic Channel Coverage (EIRP Margin)
- DL Traffic Channel Coverage (Bit Rate)
- Total DL Interference

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example showing downlink plots for HSDPA services:



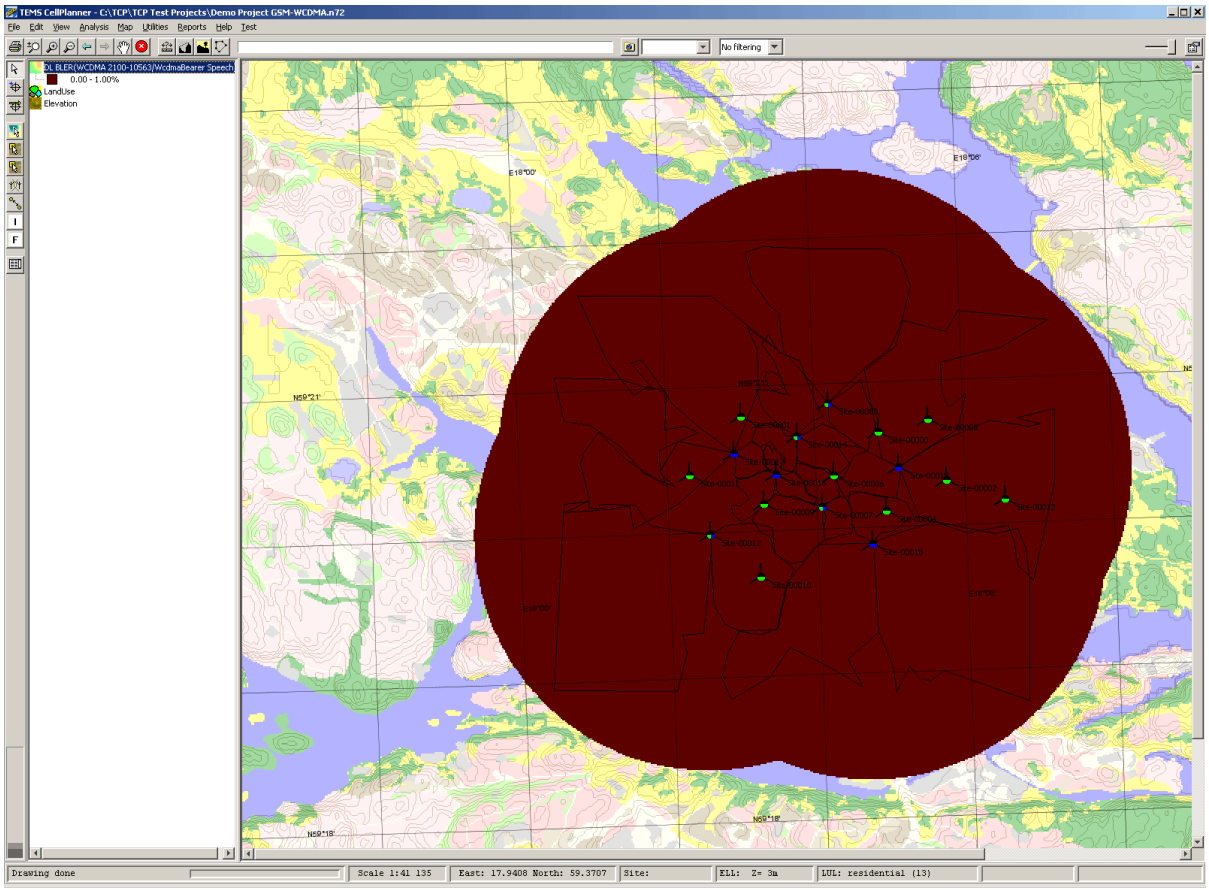
The subsequent pages describe and exemplify the DL plots.

DL Block Error Rate (BLER)

The DL Block Error Rate (BLER) plot shows the DL BLER (in %), that would be achieved at the theoretical maximum C/I of the DL dedicated traffic channel. The theoretical maximum C/I (in dB) is calculated by adding the DL EIRP margin to the target C/I. The DL BLER values are then derived from the theoretical maximum C/I values by means of a mapping curve. The result is presented color coded per bin.

Example Plot

The following example shows the DL Block Error Rate (BLER) plot:



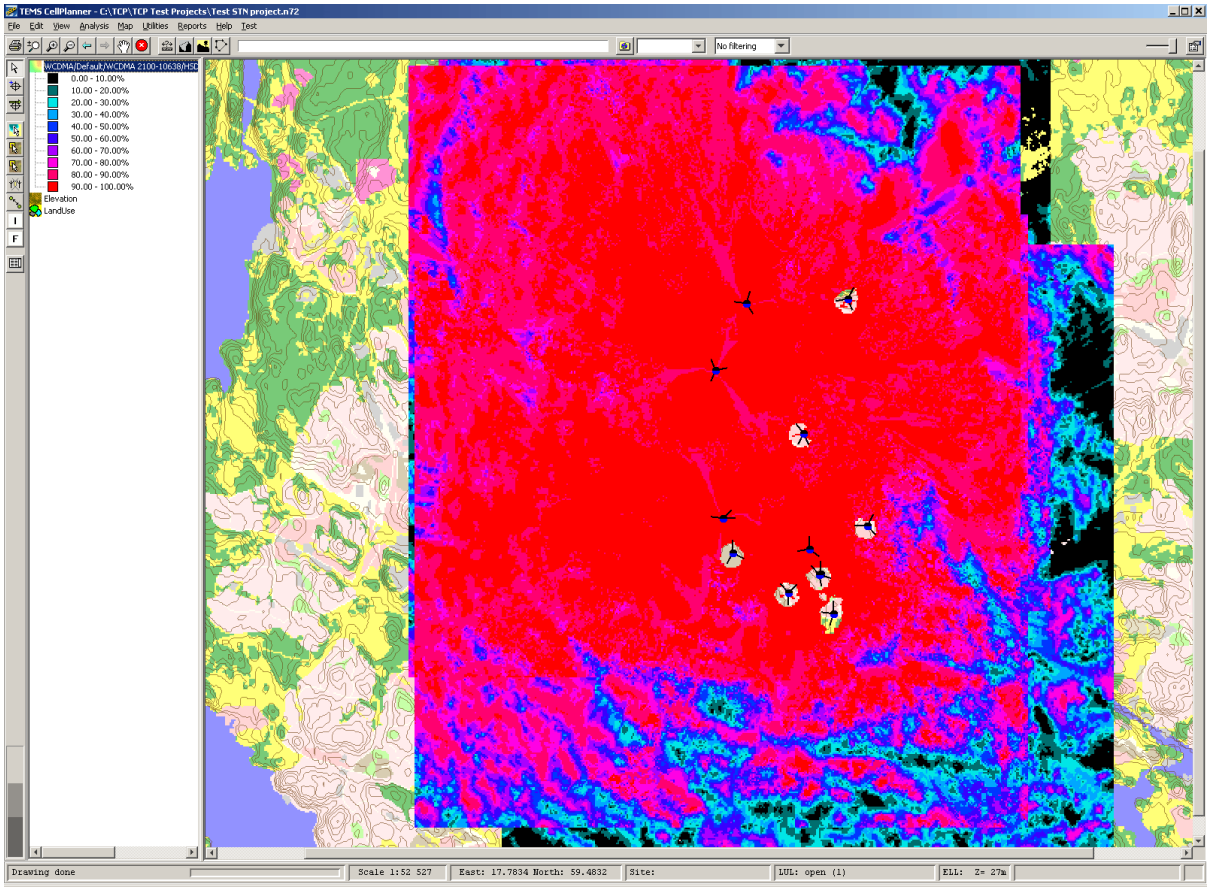
DL Coverage Probability

The DL Coverage Probability plot shows the probability (in %) that a bin gets sufficient DL Eb/Io for the selected bearer for at least one cell. The calculation uses the standard deviation of the log-normal fading set for the land use code of the bin in the fading margin table selected for the WCDMA analysis. The plot takes the upper limit on the link power for the bearer into account. The result is presented color coded per bin.

The result is presented by showing the coverage probability, color coded per bin. For services with multiple DL bitrates, the user can select a bitrate for which the probability is displayed, otherwise the probability for the lowest bitrate is shown. You can select the bitrate prior to analysis, using the Bitrate column in the **Traffic demand** window of **WCDMA analysis**.

Example Plot

The following example shows the DL Coverage Probability plot:

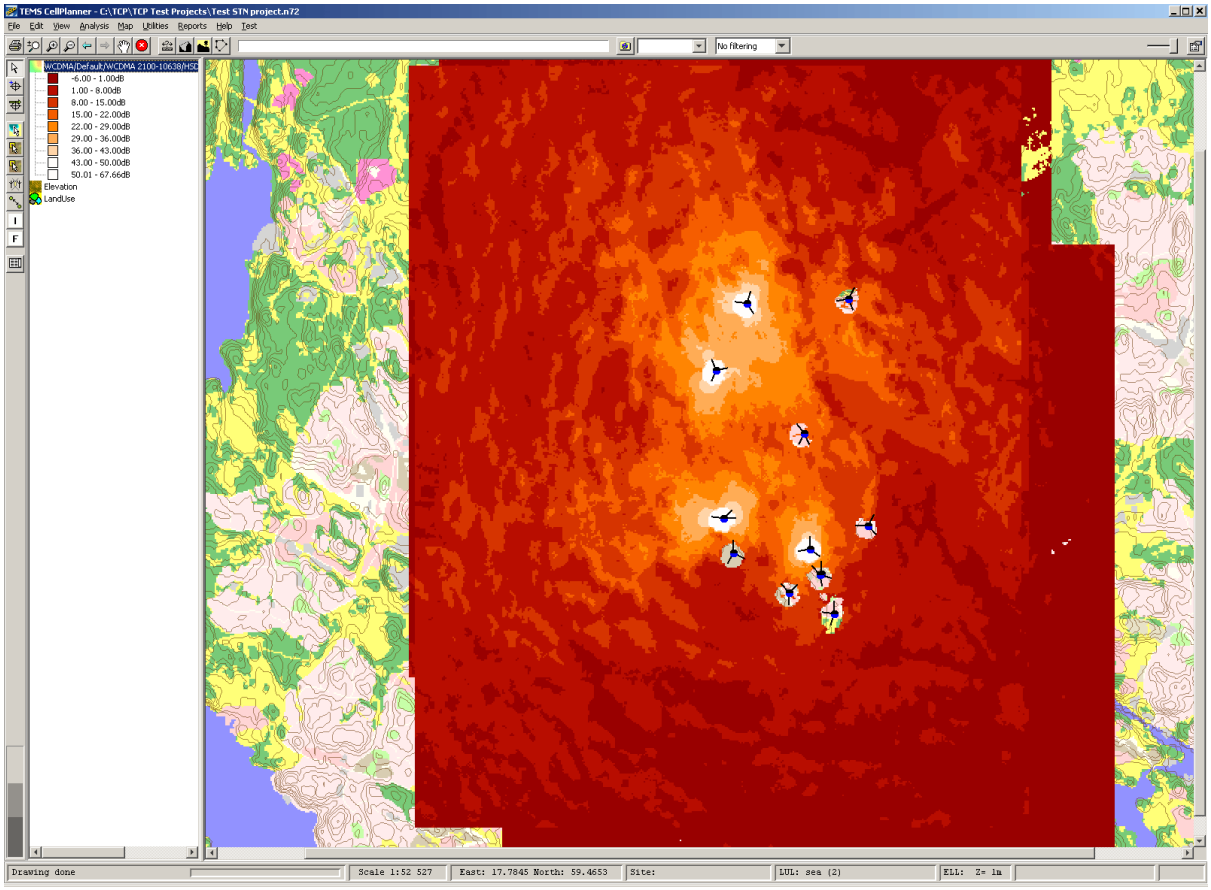


DL Noise Rise

The DL Noise Rise plot shows the DL noise rise (in dB), calculated as the total received WCDMA power and receiver noise (in dBm) in the mobile, minus the receiver noise (in dBm) in the mobile. The result is presented color coded per bin.

Example Plot

The following example shows the DL Noise Rise plot:



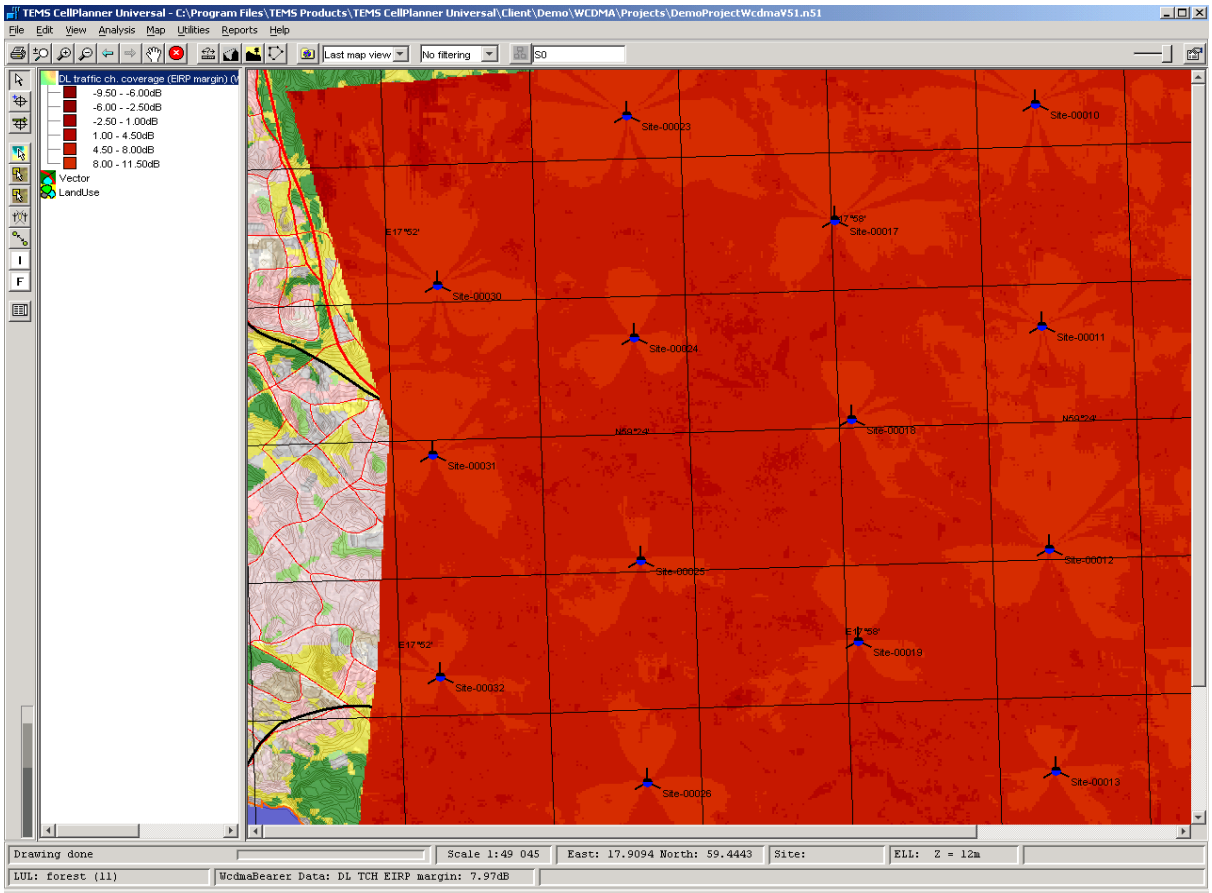
DL Traffic Channel Coverage (EIRP Margin)

The DL Traffic Channel Coverage (EIRP Margin) plot displays the coverage of the DL traffic channel for any bin in the network. The coverage is presented as a margin between the predicted achieved DL Eb/No compared to the Eb/No target of the WCDMA bearer.

Downlink traffic channel coverage is available as long as the power margin is positive and until the maximum traffic channel power allowed for the cell is reached. A negative margin for a selected bin implies that the DL traffic channel due to insufficient power available for that channel cannot cover this bin.

Example Plot

The following example shows the DL traffic channel coverage EIRP margin plot:



DL Traffic Channel Coverage (Bit Rate)

The DL Traffic Channel Coverage (Bit Rate) plot displays the coverage of the downlink traffic channels for any bin in the network. The coverage is presented as

the actual downlink bit rate that can be achieved for the selected WCDMA bearer in that bin position.

Single Bearer / Single Rate

If the selected WCDMA bearer is a single rate bearer, or if the analysis for a multi-rate WCDMA bearer has been performed on a single rate only, the display color is the same for all positions in the network where downlink coverage is available.

Downlink Coverage Achievable Bit Rate

The display color indicates the bit rate that can be achieved in any position in the network where downlink coverage is available if both:

- The selected WCDMA bearer is a multi-rate bearer with fallback rates
- WCDMA analysis has been run for multiple rates of that bearer

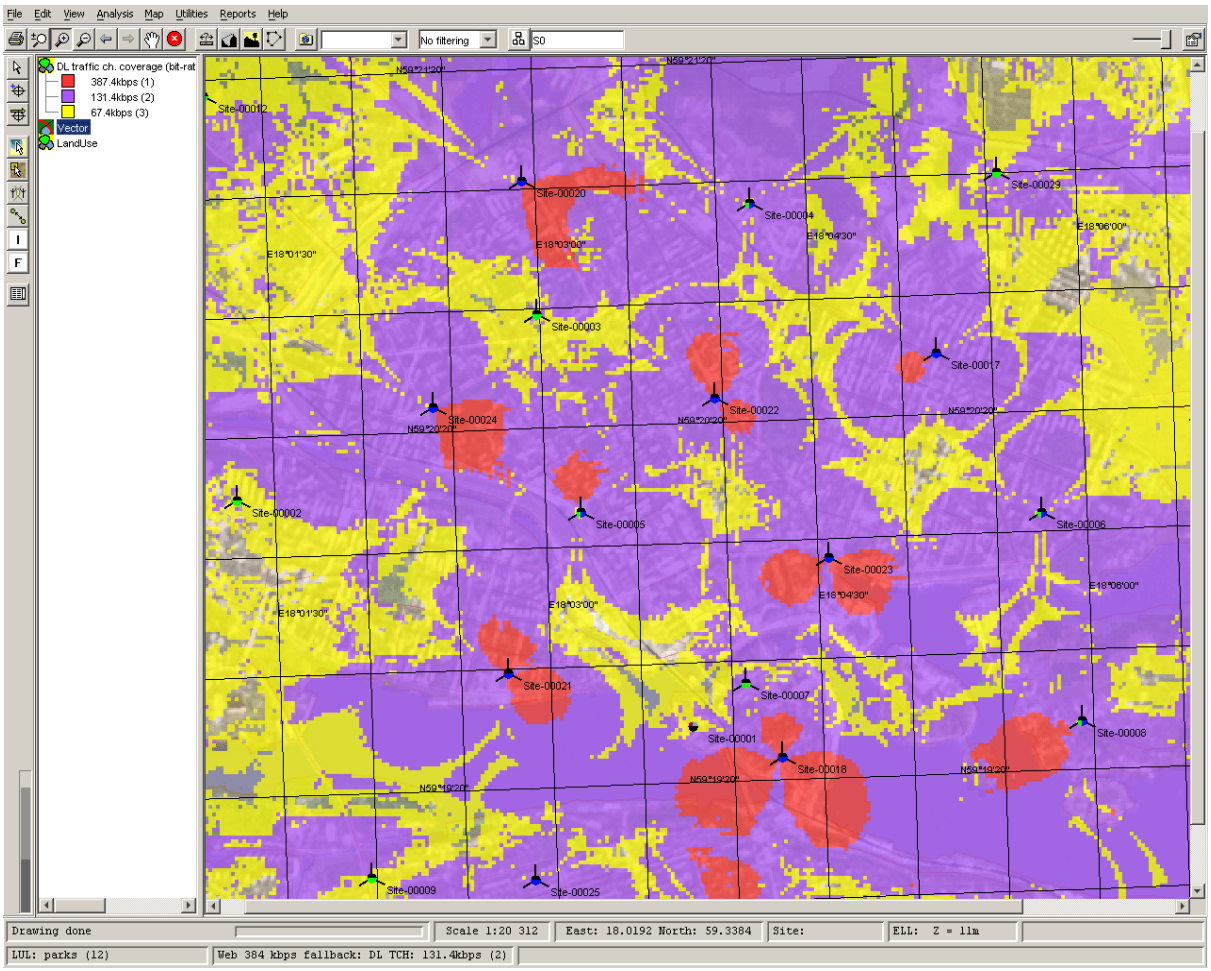
Usually the bit rates that can be achieved close to a cell are higher than bit rates at the cell boundaries.

UTRAN Channel Rate Switching

The plot also indicates the regions in which the UTRAN function channel rate switching would be triggered for the downlink.

Example Plot

The following example shows the DL traffic channel coverage (bit rate) plot:



Total DL Interference

The Total DL Interference plot displays the total interference power on the downlink as received from all cells in the network in any position for the frequency layer and WCDMA bearer selected. This plot considers both the own and best serving cell as well as all surrounding cells for a specific bin position.

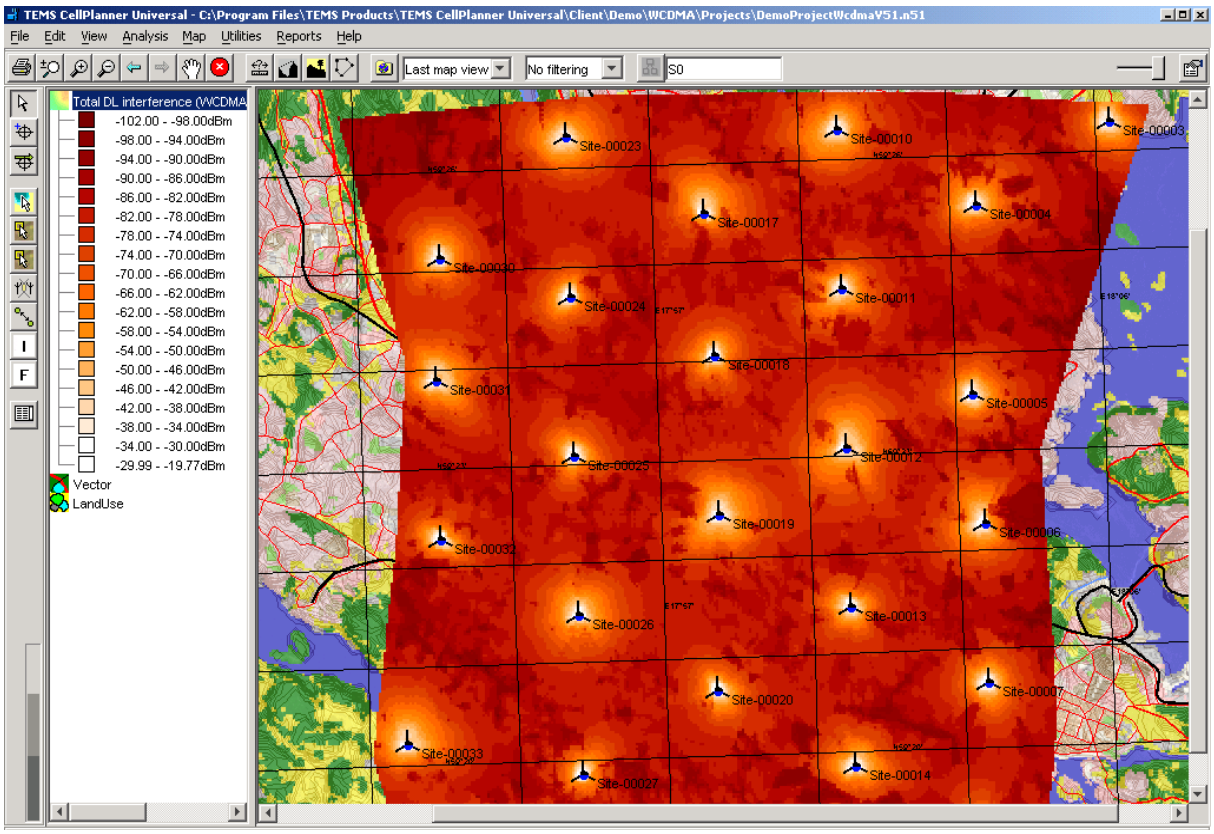
Interference Contribution

The interference contribution is considered by:

- Applying a non-orthogonality factor to that part of the total output power of the cell, considered to be orthogonal to the traffic channel.
- Adding the non-orthogonal part of the total output power of the cell for the synchronization channels (PSCH, SSCH).
- Considering the same fading margin applied to the wanted signal, since wanted signal and interference are generated by the same source in the same location.

Example Plot

The following example shows the Total DL interference plot:



EUL/HSUPA Plots

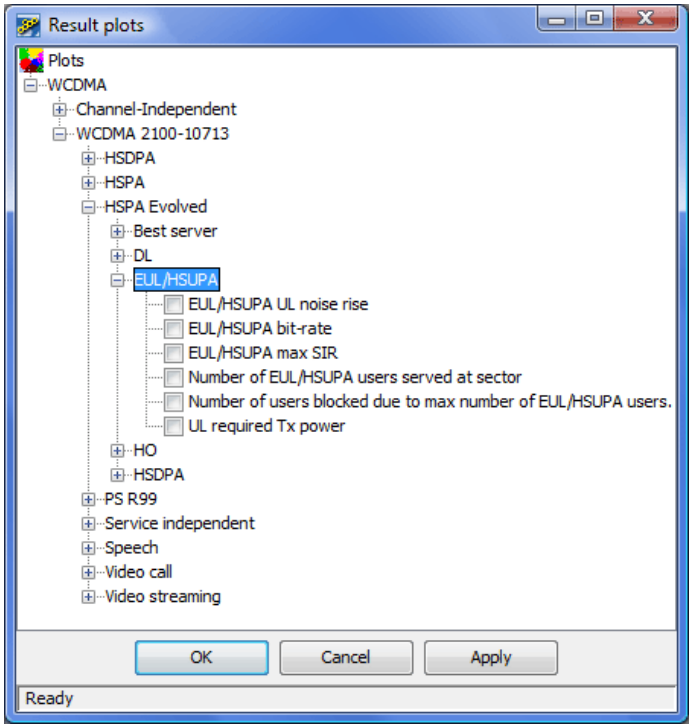
The result from WCDMA Analysis can be displayed as EUL/HSUPA plots and statistics, generated if all of the following conditions are met:

- **Cells** in the network are HSUPA/EUL capable
- EUL/HSUPA capable **terminals** are defined
- **E-DCH** radio bearers are defined
- The traffic demand mix for the simulation contains at least one **traffic demand** with a radio bearer utilizing E-DCH and an EUL/HSUPA capable terminal
- The **pathloss fading margins** shall be 0 to achieve acceptable results
- WCDMA **analysis** is run with **EUL/HSUPA enabled**

The EUL/HSUPA plots listed below can be generated per frequency and service (WCDMA bearer):

- EUL/HSUPA UL Noise Rise
- EUL/HSUPA Bit-Rate
- EUL/HSUPA Max SIR
- EUL/HSUPA Users Served at Sector
- Users Blocked Due to Max EUL/HSUPA Users
- UL Required Tx Power

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the example below showing EUL/HSUPA plots for Evolved HSPA services:



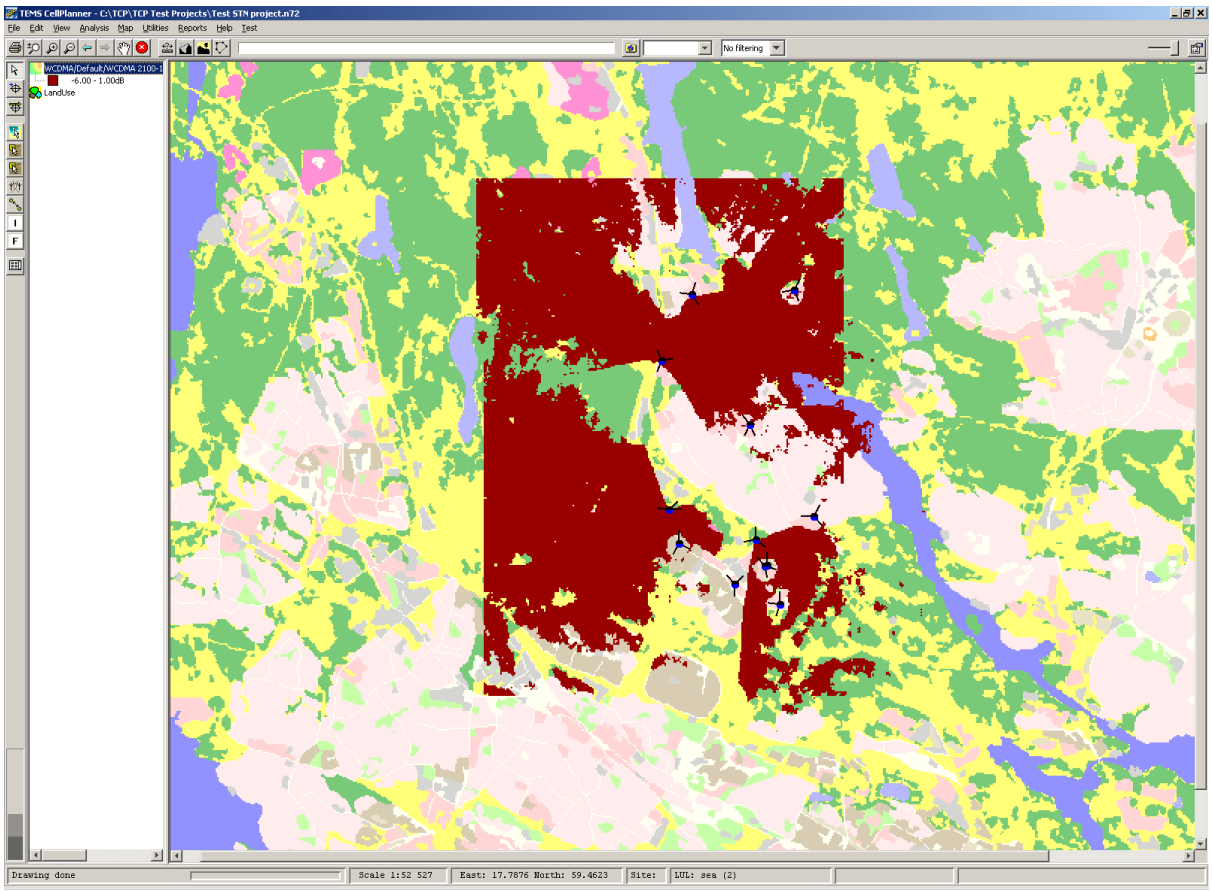
The subsequent pages describe and exemplify the EUL/HSUPA plots.

EUL/HSUPA UL Noise Rise

The EUL UL Noise Rise plot shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the uplink noise rise of the cell.

Example Plot

The following example shows the EUL UL Noise Rise plot:

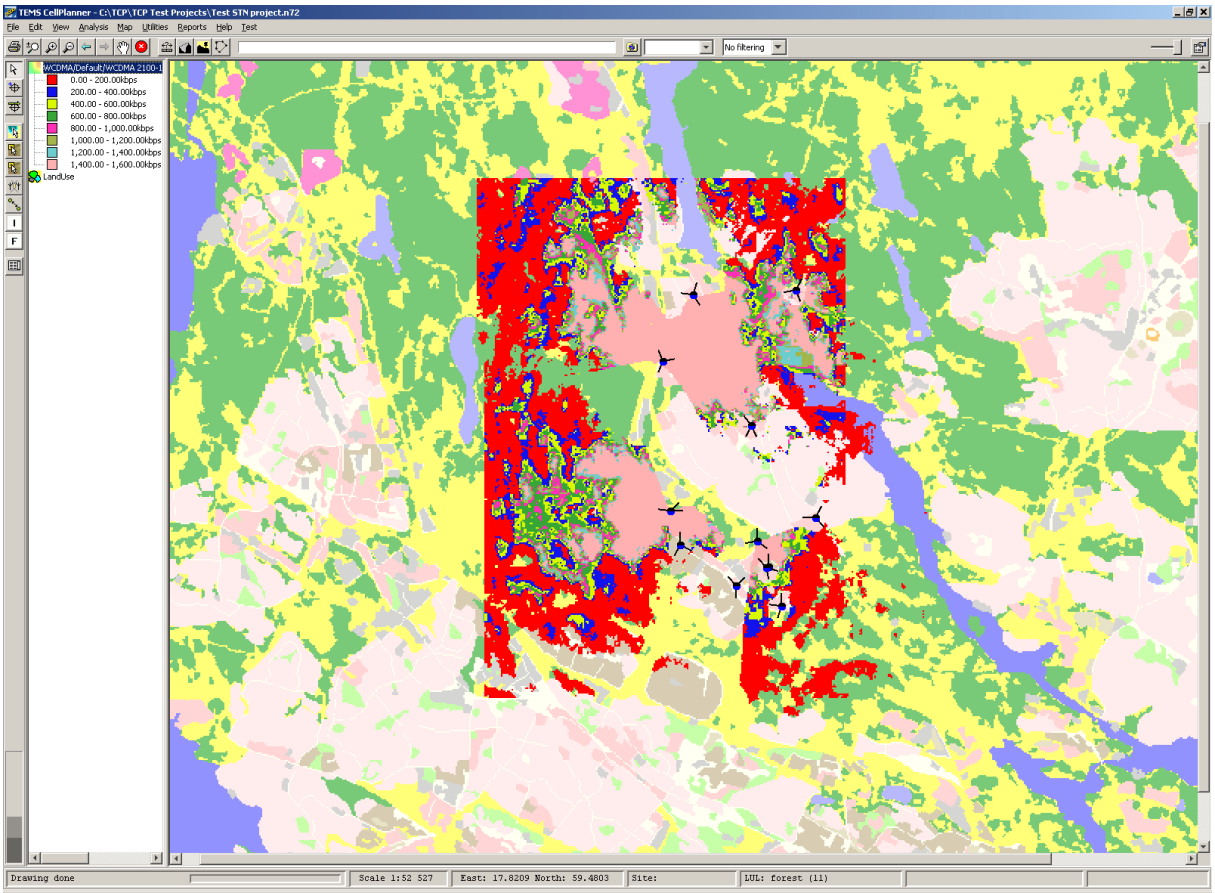


EUL/HSUPA Bit-Rate

The EUL Bit-Rate plot shows, color encoded for every bin, the EUL bit-rate values derived from the EUL SIR values by means of a mapping curve. The maximum data rate per bin is different for terminals with different properties, so the application considers the terminal category. The resulting E-DCH data rate values are plotted for all bins within the EUL best server area.

Example Plot

The following example shows the EUL Bit-Rate plot:

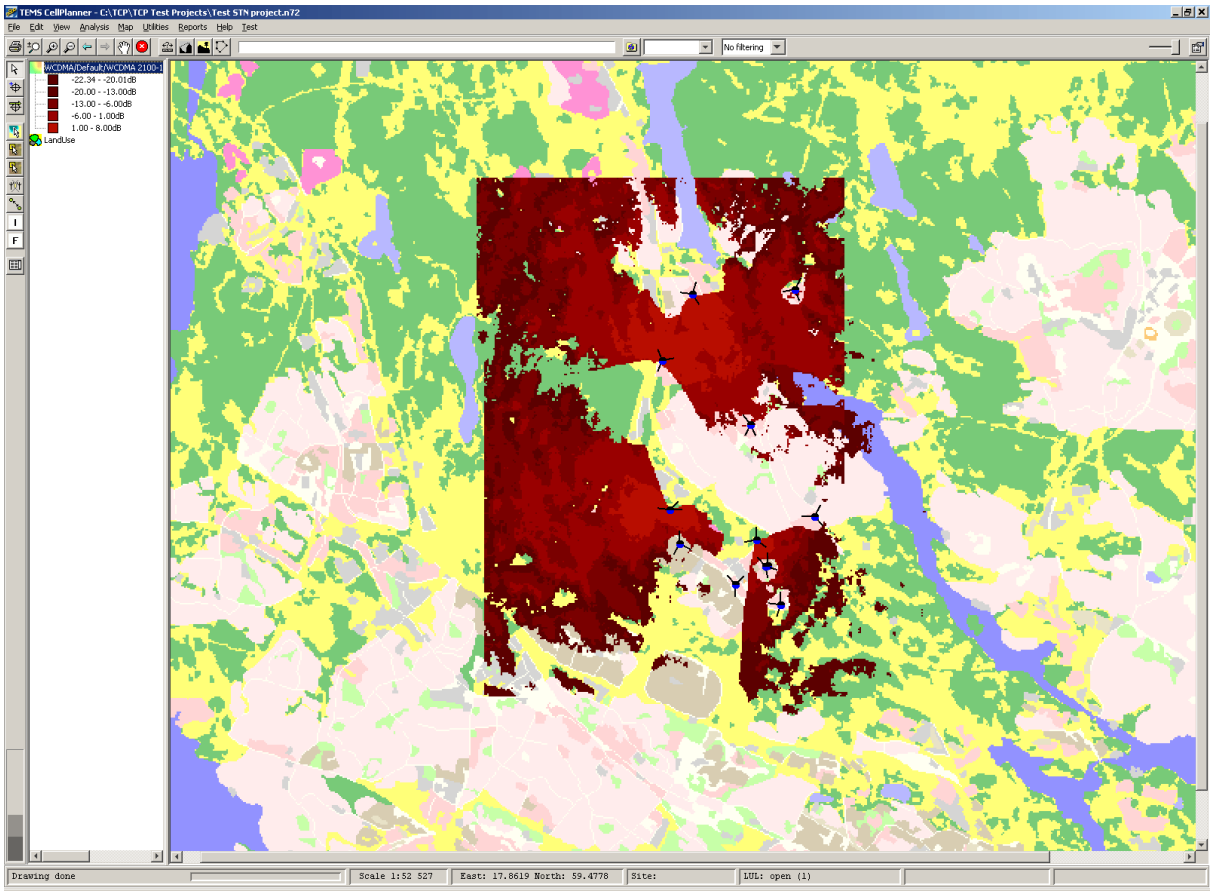


EUL/HSUPA Max SIR

The EUL Max SIR plot shows, color encoded for every bin, the EUL SIR values achieved when the terminal uses its maximum output power. The EUL serving cell is identical to the best server of the E-DCH. TEMS CellPlanner uses the E-DCH Best Server plot to find the EUL serving cell for every bin when the interference is calculated.

Example Plot

The following example shows the EUL Max SIR plot:

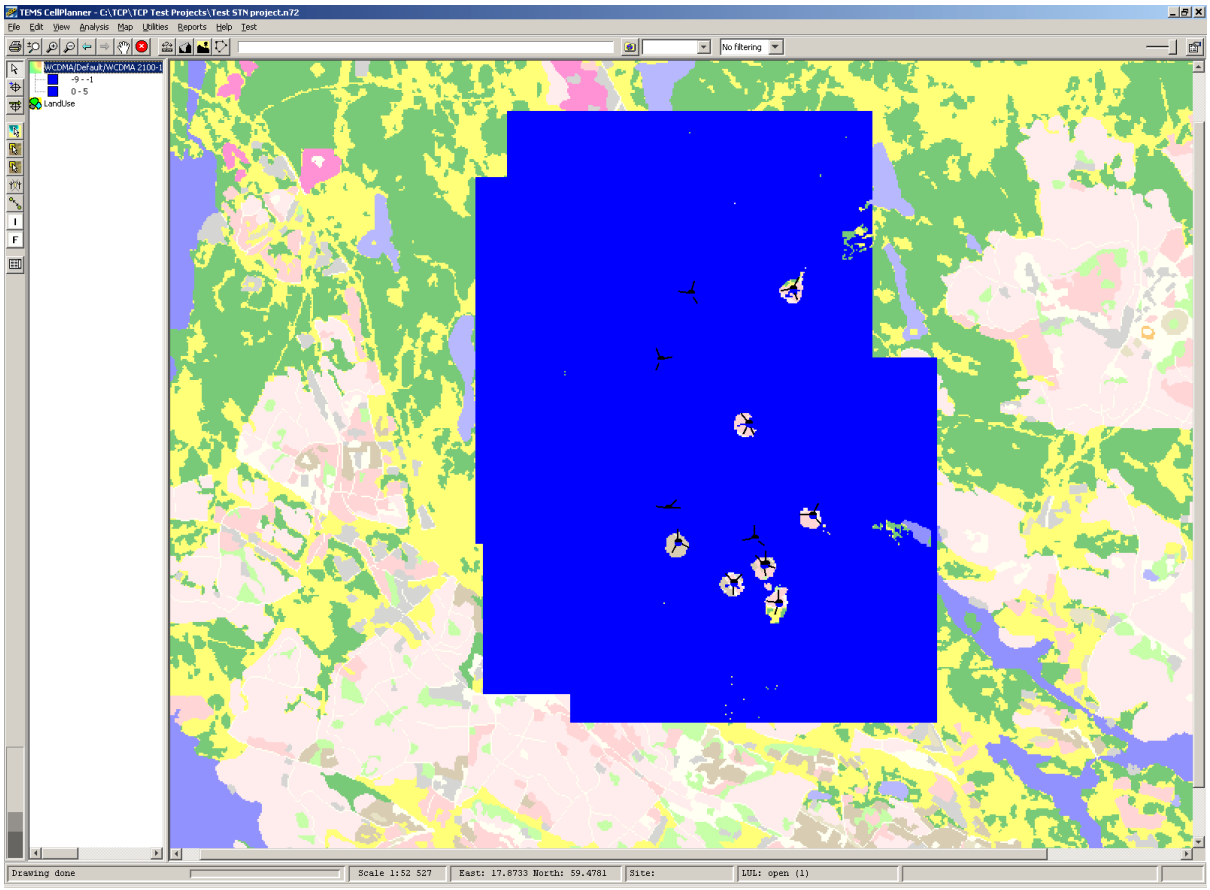


EUL/HSUPA Users Served at Sector

The EUL Users Served at Sector plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the average number of served EUL users in the cell, calculated over all random trials, the number of E-DCH users served at the sector.

Example Plot

The following example shows the EUL Users Served at Sector plot:



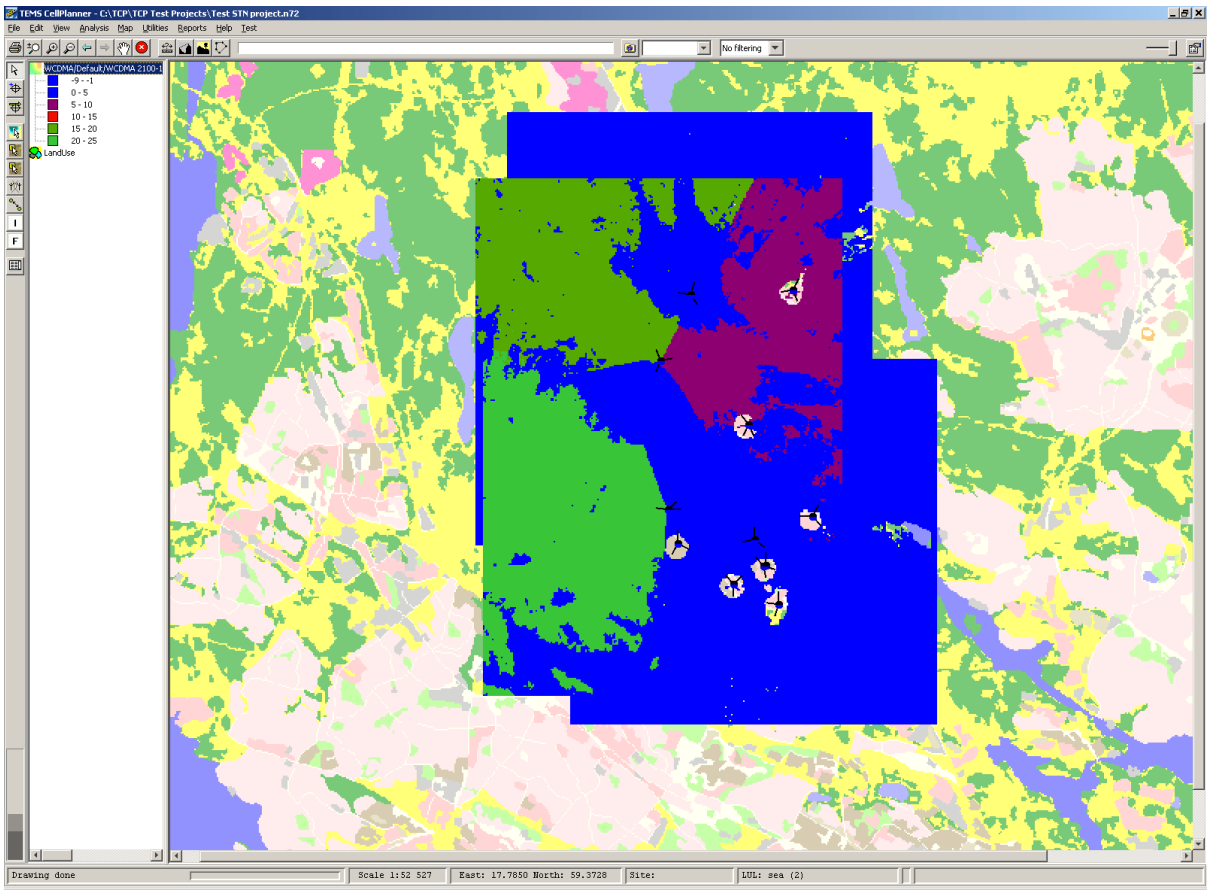
Users Blocked Due to Max EUL/HSUPA Users

The Users Blocked Due to Max EUL Users plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the average number of users blocked in the cell due to the upper limit on the number of EUL users, calculated over all random trials.

TEMS CellPlanner calculates the total number of EUL users for the terminal types served. If the sum over all terminal types exceeds the user defined maximum number of EUL users, then randomly selected terminals are disconnected until the limits are no longer exceeded.

Example Plot

The following example shows the Users Blocked Due to Max EUL Users plot:

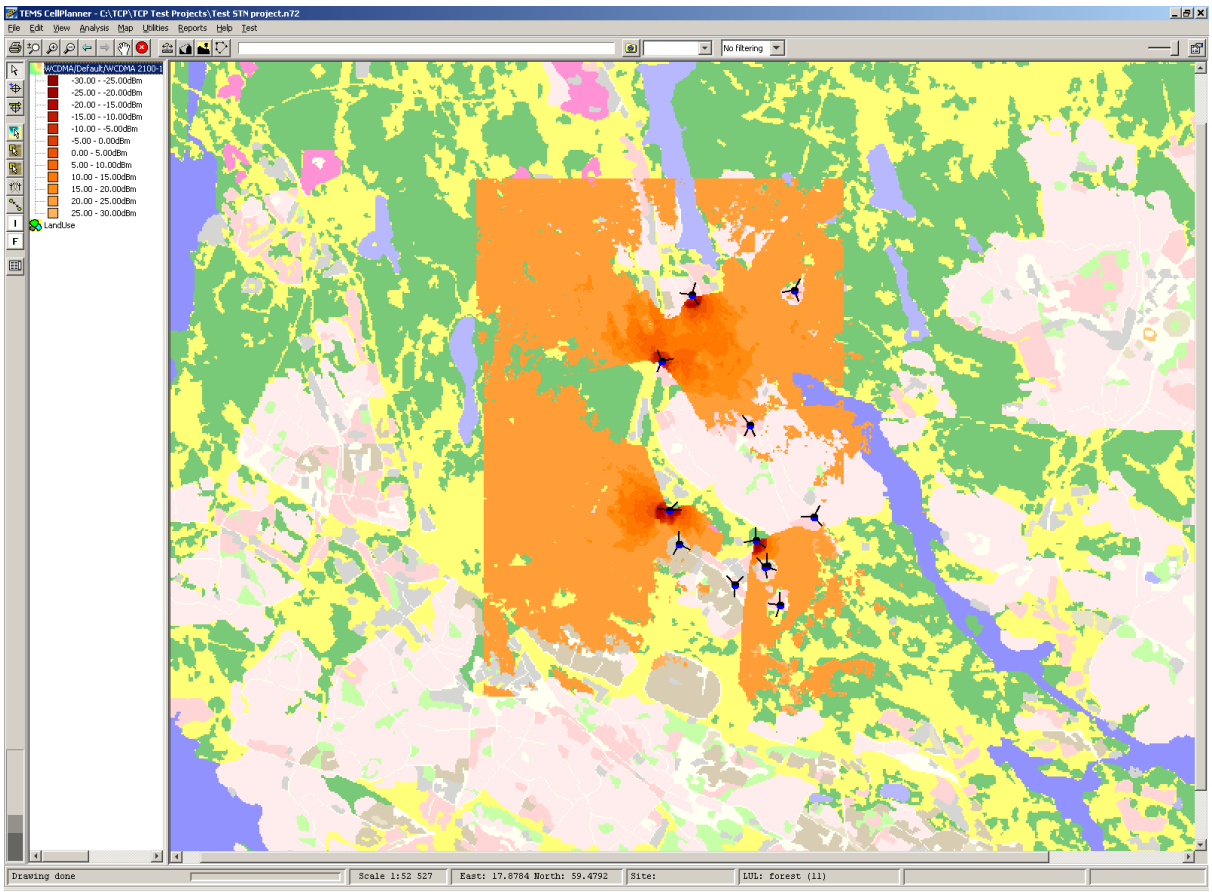


UL Required Tx Power

The UL Required Tx Power plot shows the required Tx power for the selected bearer. The plot shows, color encoded for every bin, the terminal output power required to achieve the maximum EUL bit-rate of the terminal type.

Example Plot

The following example shows the UL Required Tx Power plot:

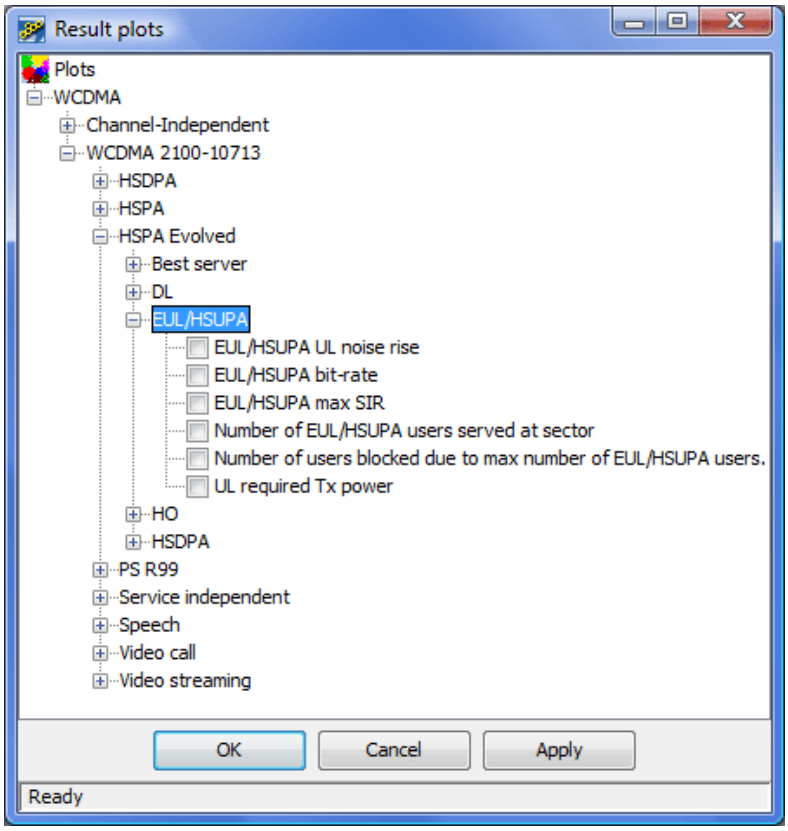


WCDMA Handover Plots

The result from WCDMA Analysis with option **Handover status** enabled can be displayed as handover (HO) plots, generated per frequency and service (WCDMA bearer):

- Handover Map
- Number of Available Handover Candidates

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the example below showing handover plots for HSPA services:



The subsequent pages describe and exemplify the handover plots.

Handover Map

The Handover Map plot displays the handover status for each bin in the network that meets the following requirements:

- The bin is covered by a CPICH with a quality in terms of Ec/Io that is above the threshold value as defined for WCDMA analysis.
- The quality of the downlink traffic channel in terms of achieved E_b/N_o must be above the specified threshold for the selected WCDMA bearer.
- The quality of the uplink traffic channel in terms of achieved E_b/N_o must be above the specified threshold for the selected WCDMA bearer.

Handover Conditions

Depending on coverage conditions for CPICH, uplink and downlink traffic channels, the following handover conditions might occur:

Handover Status	Condition of Selected Bin
No handover	Served by one cell only (best server)
Soft handover	Served by two or more cells belonging to different RBSs. All cells belonging to the active set contribute to the soft handover connection.
Softer handover	Served by two or more cells belonging to the same RBS. All cells belonging to the active set contribute to the softer handover connection
Soft/Softer handover	Served by a combination of soft and softer handover.
No service	Outside the coverage area of the network.

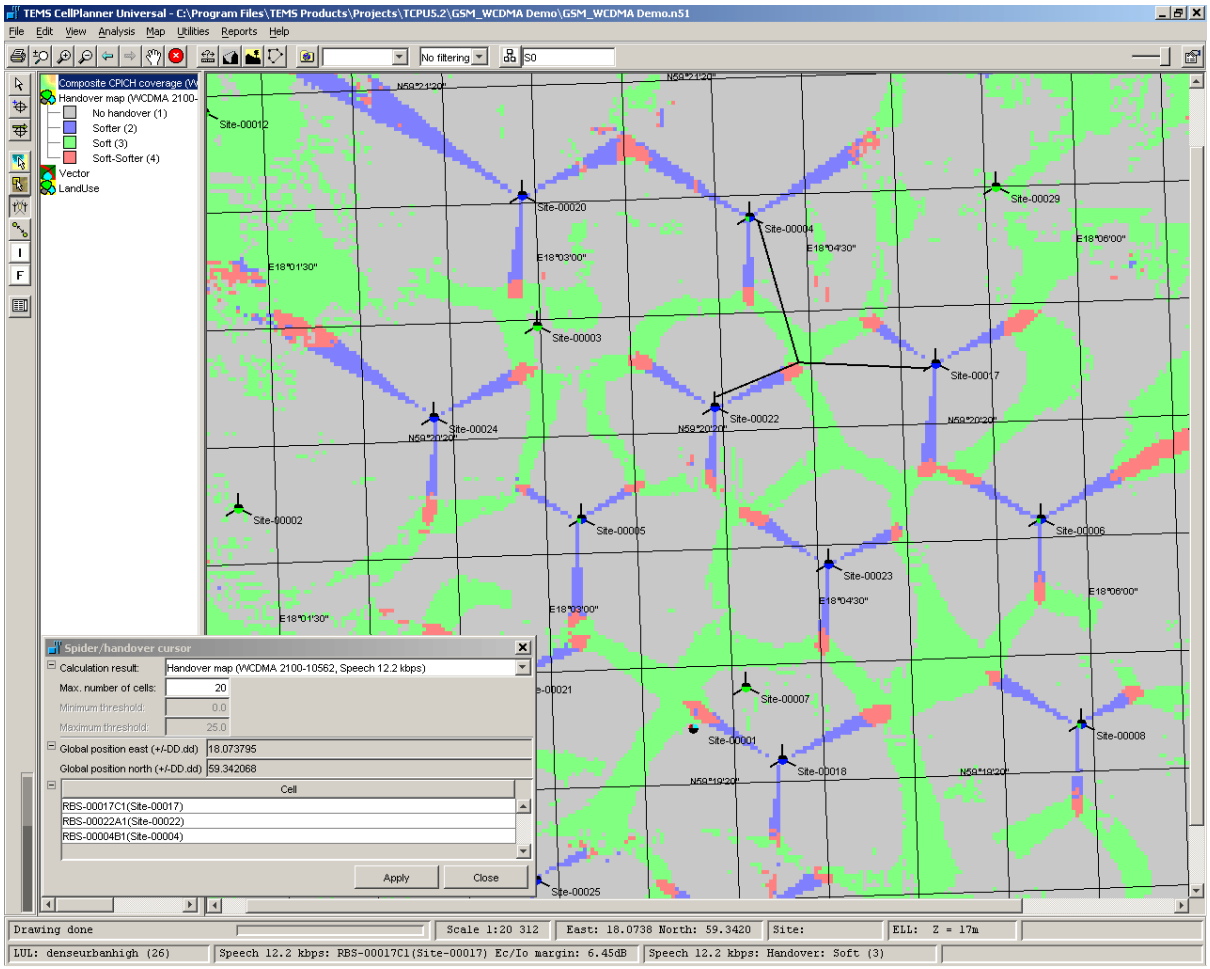
Color In Handover Map

In the map display, the handover map contains various color-coded polygons corresponding to handover regions.

The type of handover is represented by a color associated with a region, described in the legend.The following example shows the color coding of handover states. In the status field TEMS CellPlanner displays the handover type with latitude and longitude in the current cursor position.

Example Plot

The following example shows the WCDMA handover map plot with the handover cursor active in the display:



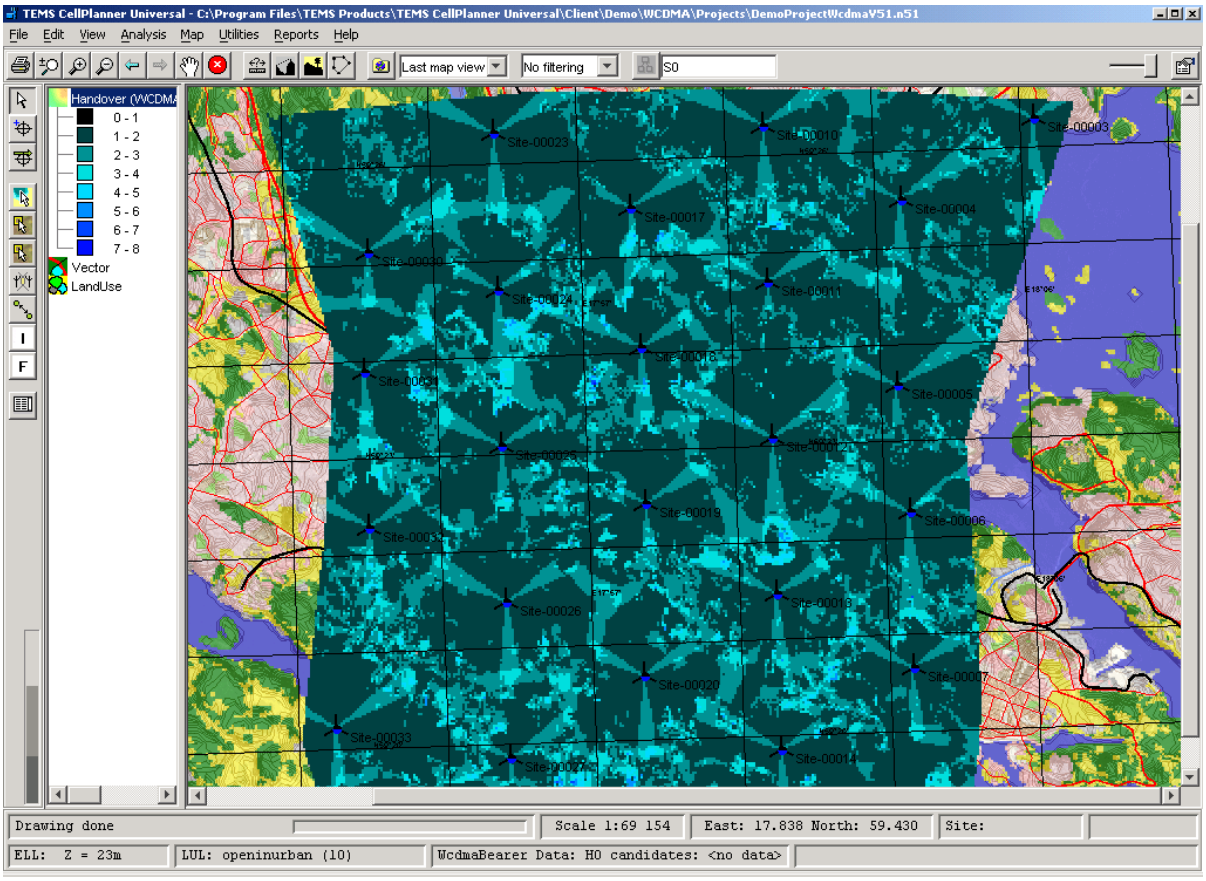
Number of Available Handover Candidates

The Number of Available Handover Candidates plot displays the number of cells that meet the requirements for being a handover candidate for the selected bin in the network.

All handover candidates are displayed, and no distinction is made between best serving cells. Cells belonging to the active set and the candidate set are considered in the display. If the number of available handover candidates is substantially larger than the active set size defined for WCDMA analysis, a high risk exists for strong pilot pollution in the corresponding area. This plot helps to pinpoint areas with high risk of pilot pollution.

Example Plot

The following example shows the number of available handover candidates plot:

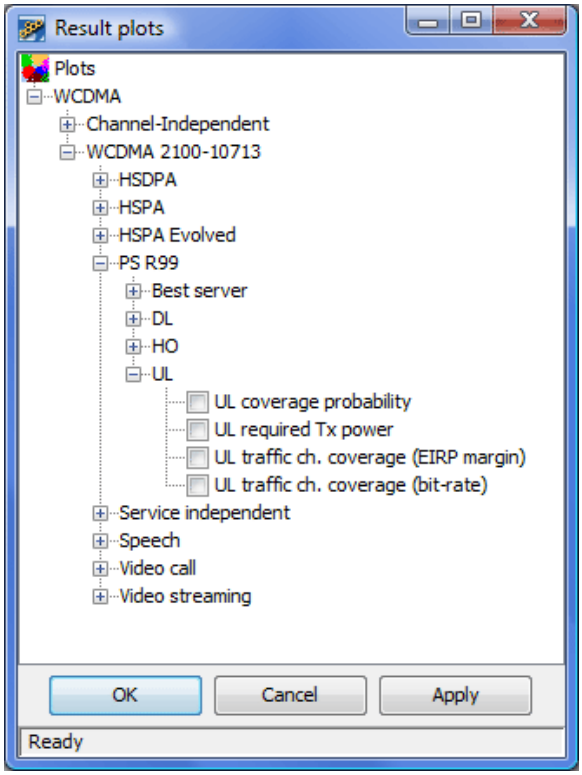


WCDMA UL Plots

The result from WCDMA Analysis with option **UL traffic channel coverage** enabled can be displayed as uplink plots, generated per frequency and for services including an R99 or HSDPA (not HSUPA) bearer:

- UL Coverage Probability
- UL Required Tx Power
- UL Traffic Channel Coverage (EIRP Margin)
- UL Traffic Channel Coverage (Bit Rate)

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example showing uplink plots for R99 services:



The subsequent pages describe and exemplify the uplink plots.

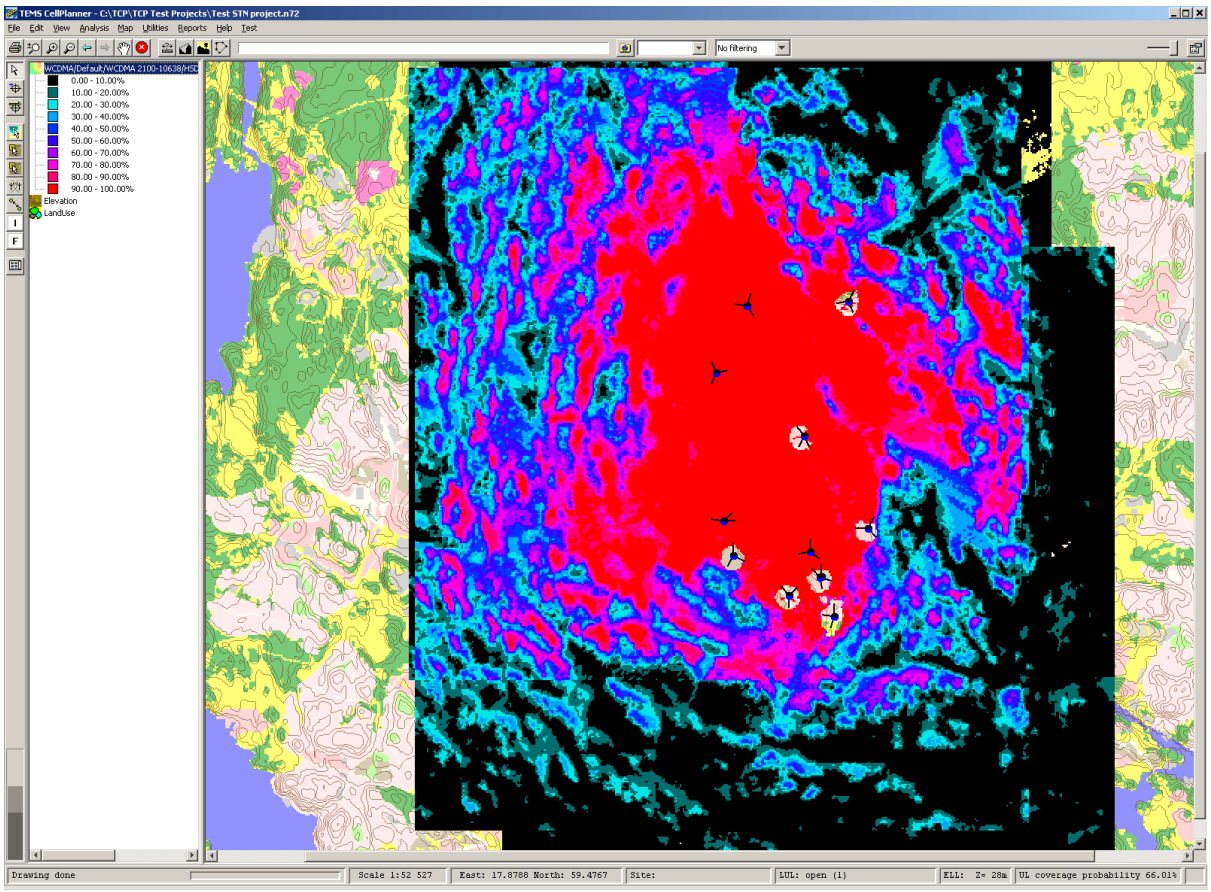
UL Coverage Probability

The UL Coverage Probability plot shows the probability (in %) that a terminal gives sufficient UL Eb/Io for the selected bearer in at least one cell. The calculation uses the standard deviation of the log-normal fading set for the land use code of the bin in the fading margin table selected in WCDMA analysis, and takes the upper limit on the terminal power into account.

The result is presented by showing the coverage probability, color coded per bin. For services with multiple UL bitrates, you can select a bitrate for which the probability is displayed, otherwise the probability for the lowest bitrate is shown. You must select the bitrate prior to WCDMA analysis.

Example Plot

The following example shows the UL Coverage Probability plot:

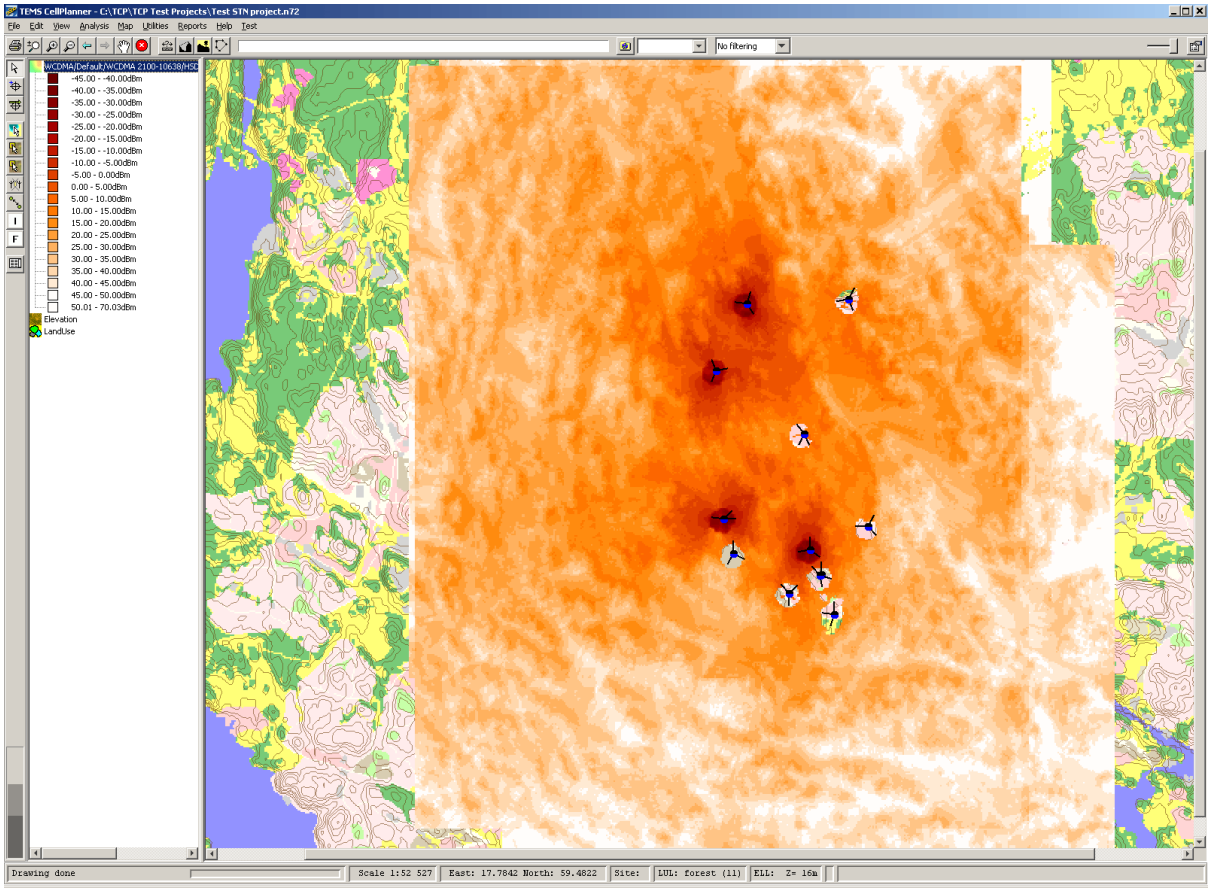


UL Required Tx Power

The UL Required Tx Power plot shows the UL transmitter power (in dBm), required to achieve the target C/I, taking into account the fade margin M_{link} UL and the noise rise in the cell. The result is presented color coded per bin.

Example Plot

The following example shows the UL Required Tx Power plot:



UL Traffic Channel Coverage (EIRP Margin)

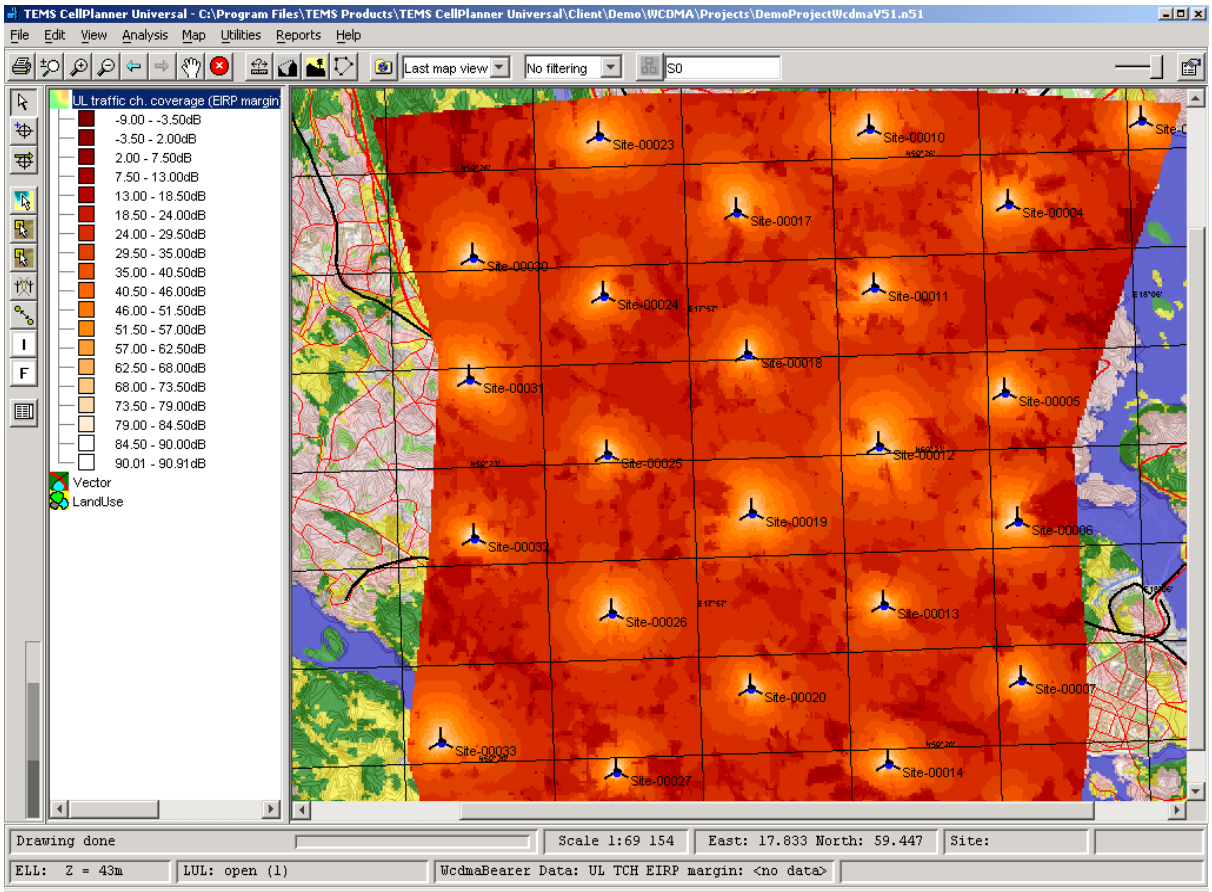
The UL Traffic Channel Coverage (EIRP Margin) plot displays the coverage of the uplink traffic channel for any bin in the network. The coverage is presented as a margin between the maximum traffic output power of the mobile terminal (effective isotropic radiated power -EIRP) and the actual achieved output power.

Uplink traffic channel coverage is available as long as the power margin is positive and until the maximum traffic channel power allowed for the mobile terminal has been reached. A negative margin for a selected bin implies, that the UL traffic channel due to insufficient power available for that channel cannot cover this bin.

This plot does not relate to the minimum output power of a mobile terminal. The power margin up to the maximum transmit power of the terminal is displayed.

Example Plot

The following example shows the plot:



UL Traffic Channel Coverage (Bit Rate)

The UL Traffic Channel Coverage (Bit Rate) plot displays the coverage of the uplink traffic channels for any bin in the network. The coverage is presented as the actual uplink bit rate that can be achieved for the selected WCDMA bearer in that bin position.

Single Rate / Multi Rate Bearer

If the selected WCDMA bearer is a single rate bearer, or if WCDMA analysis has been performed for a multi-rate WCDMA bearer on a single rate only, the display color is the same for all positions in the network where UL coverage is available.

Uplink Coverage Achievable Bit Rate

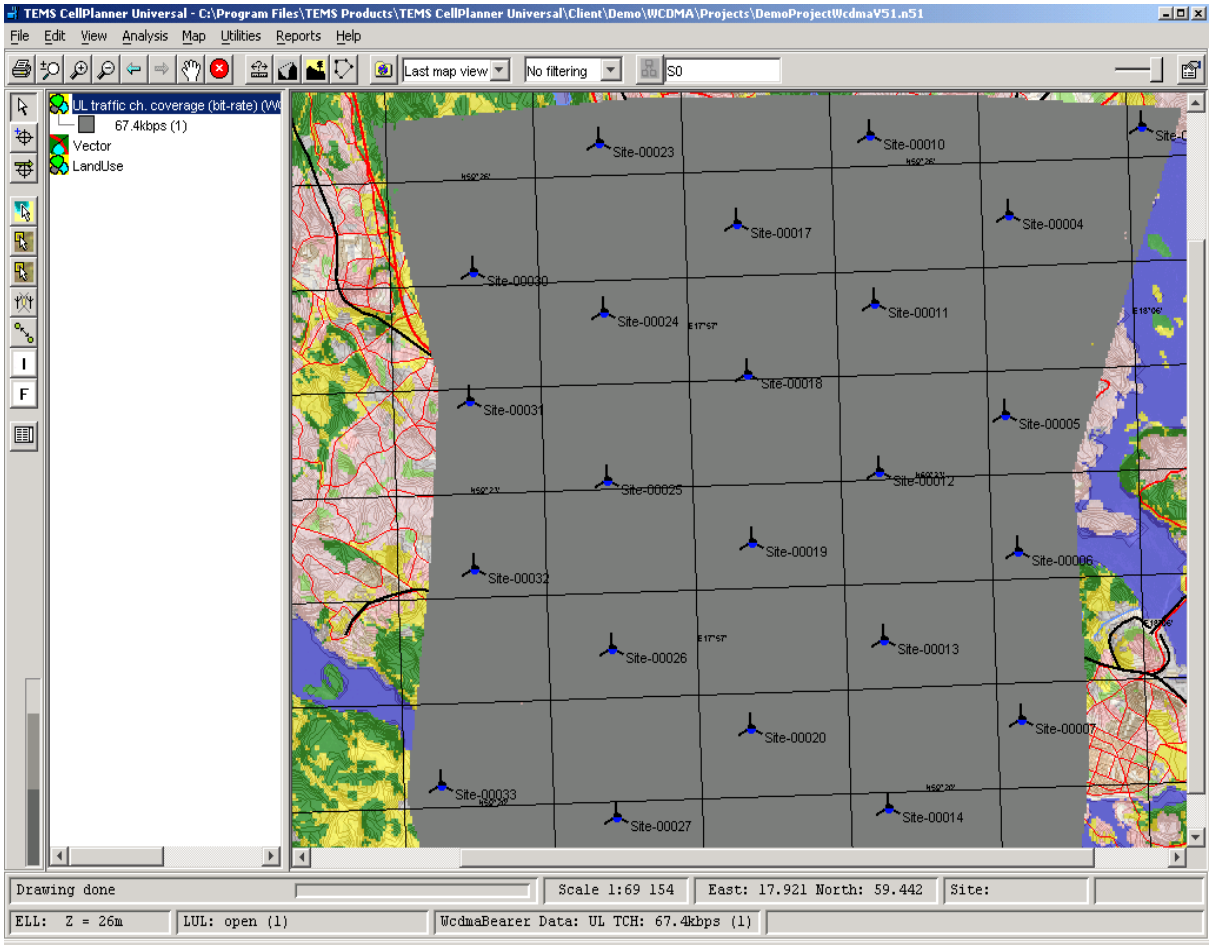
If the selected WCDMA bearer is a multi-rate bearer with fallback rates and if WCDMA analysis has been run for multiple rates of that bearer, the display color indicates that the bit rate that can be achieved in any position in the network where uplink coverage is available. Usually the bit rates that can be achieved close to a cell are higher than bit rates at the cell boundaries.

UTRAN Channel Rate Switching

This plot also indicates the regions in which the UTRAN function channel rate switching would be triggered for the uplink.

Example Plot

The following example shows the UL Traffic Channel Coverage (Bit Rate) plot:



HSDPA Plots

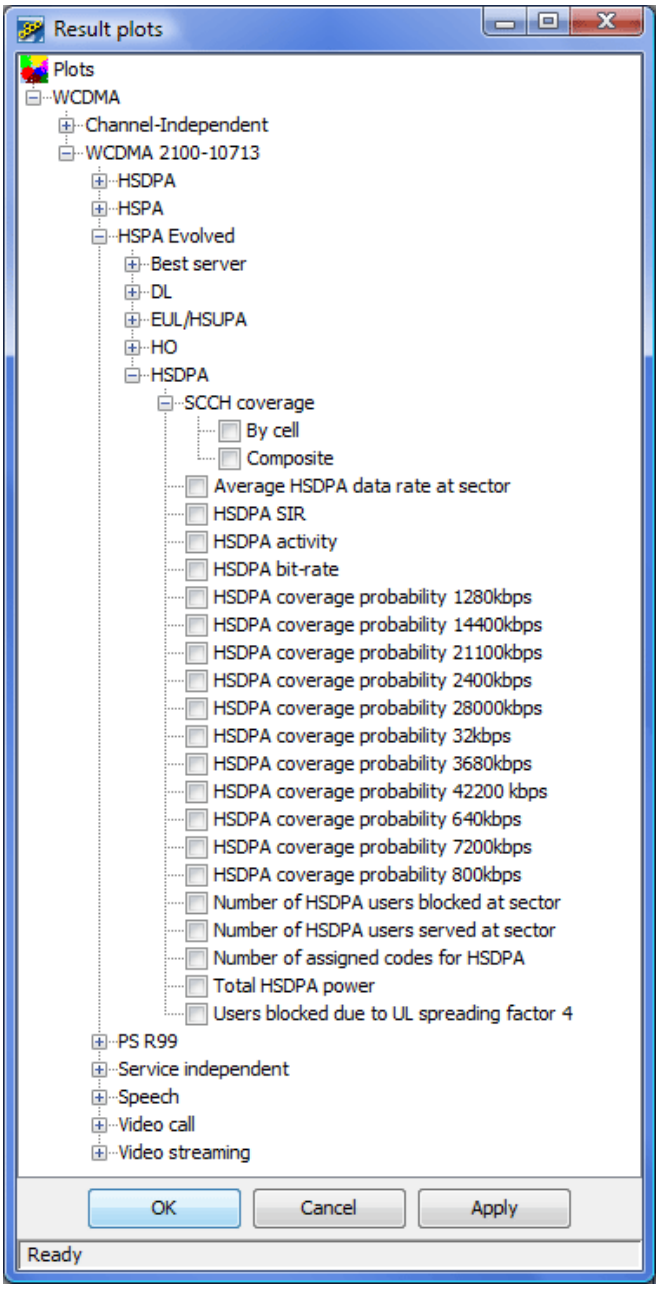
The result from WCDMA Analysis can be displayed as HSDPA plots and statistics, generated per frequency and service (WCDMA bearer) if all of the following conditions are met:

- **Cells** in the network are HSDPA capable
- HSDPA capable **terminals** are defined
- **A-DCH** radio bearers are defined
- The traffic demand mix for the simulation contains at least one **traffic demand** with an A-DCH radio bearer and an HSDPA capable terminal
- WCDMA **analysis** is run with HSDPA enabled
- For high speed HSDPA coverage probability, there are further requirements on **terminal categories, modulation scheme and number of antennas**. Detailed requirements are specified per plot.

The following HSDPA plots can be generated:

- SCCH Coverage by Cell
- SCCH Coverage Composite
- Average HSDPA Data Rate at Sector
- HSDPA SIR
- HSDPA Bit Rate
- HSDPA Coverage Probability 32 kbps
- HSDPA Coverage Probability 640 kbps
- HSDPA Coverage Probability 800 kbps
- HSDPA Coverage Probability 1280 kbps
- HSDPA Coverage Probability 2400 kbps
- HSDPA Coverage Probability 3680 kbps
- HSDPA Coverage Probability 7200 kbps
- HSDPA Coverage Probability 14400 kbps
- HSDPA Coverage Probability 21100 kbps
- HSDPA Coverage Probability 28000 kbps
- HSDPA Coverage Probability 42200 kbps
- Number of HSDPA Users Blocked at Sector
- Number of HSDPA Users Served at Sector
- Number of Assigned Codes for HSDPA
- Total HSDPA Power
- Users Blocked Due to Uplink Spreading Factor 4

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the example below showing HSDPA plots for Evolved HSPA services:



The subsequent pages describe and exemplify the HSDPA plots.

SCCH Coverage by Cell

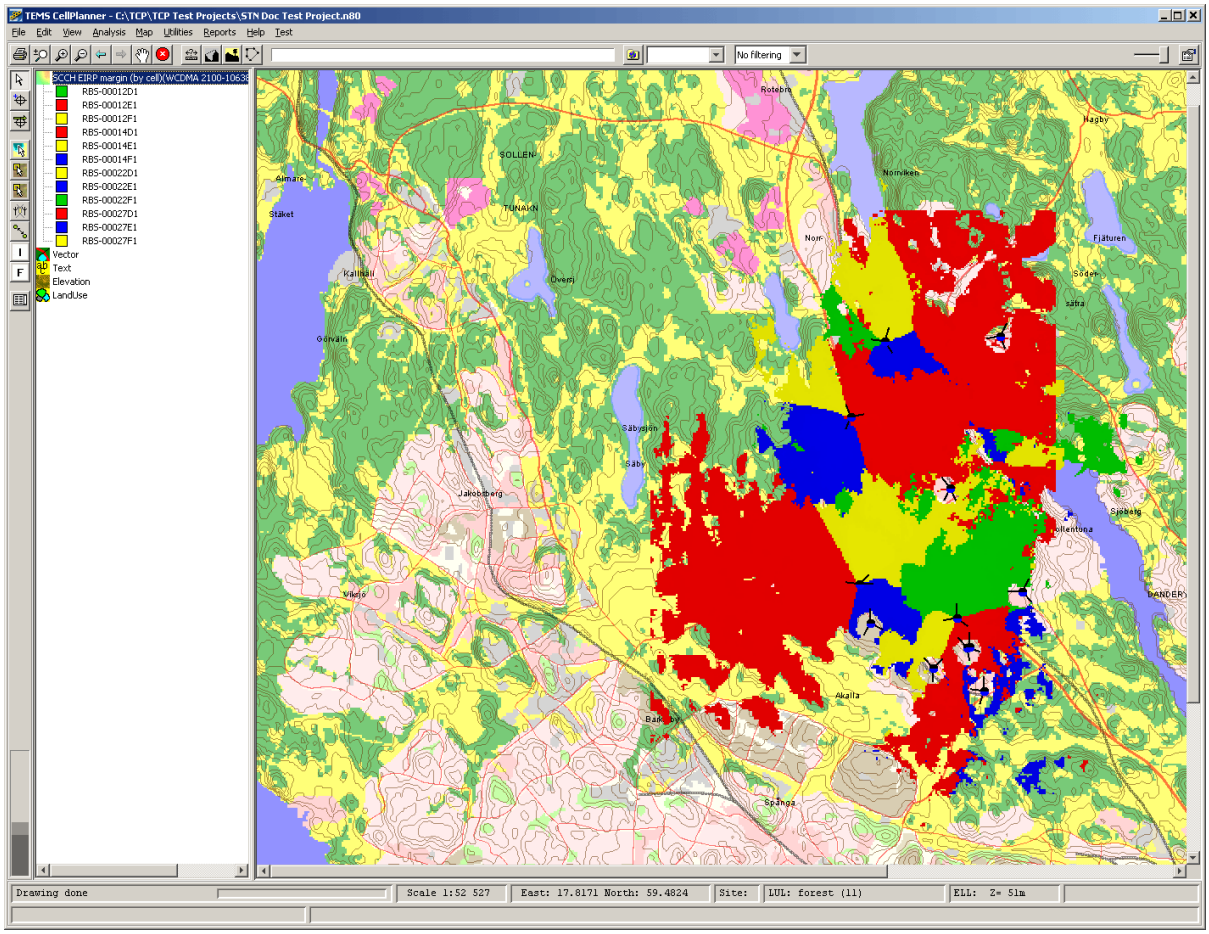
The plots related to the HS-SCCH coverage are similar to the P-CPICH plots. They display the coverage area for the HS-SCCH based on the achieved downlink Ec/Io for the HS-SCCH and in relation to the parameter **Min. DL Ec/Io for HS-SCCH** as you define.

The HS-SCCH plots are available as:

- By-cell plots, showing the best server coverage for the cell based on the HS-SCCH coverage area
- Composite plots, showing the combined HS-SCCH downlink coverage as a C/I margin above the minimum defined threshold.

Example Plot

The following is an example of the plot:



SCCH Coverage Composite

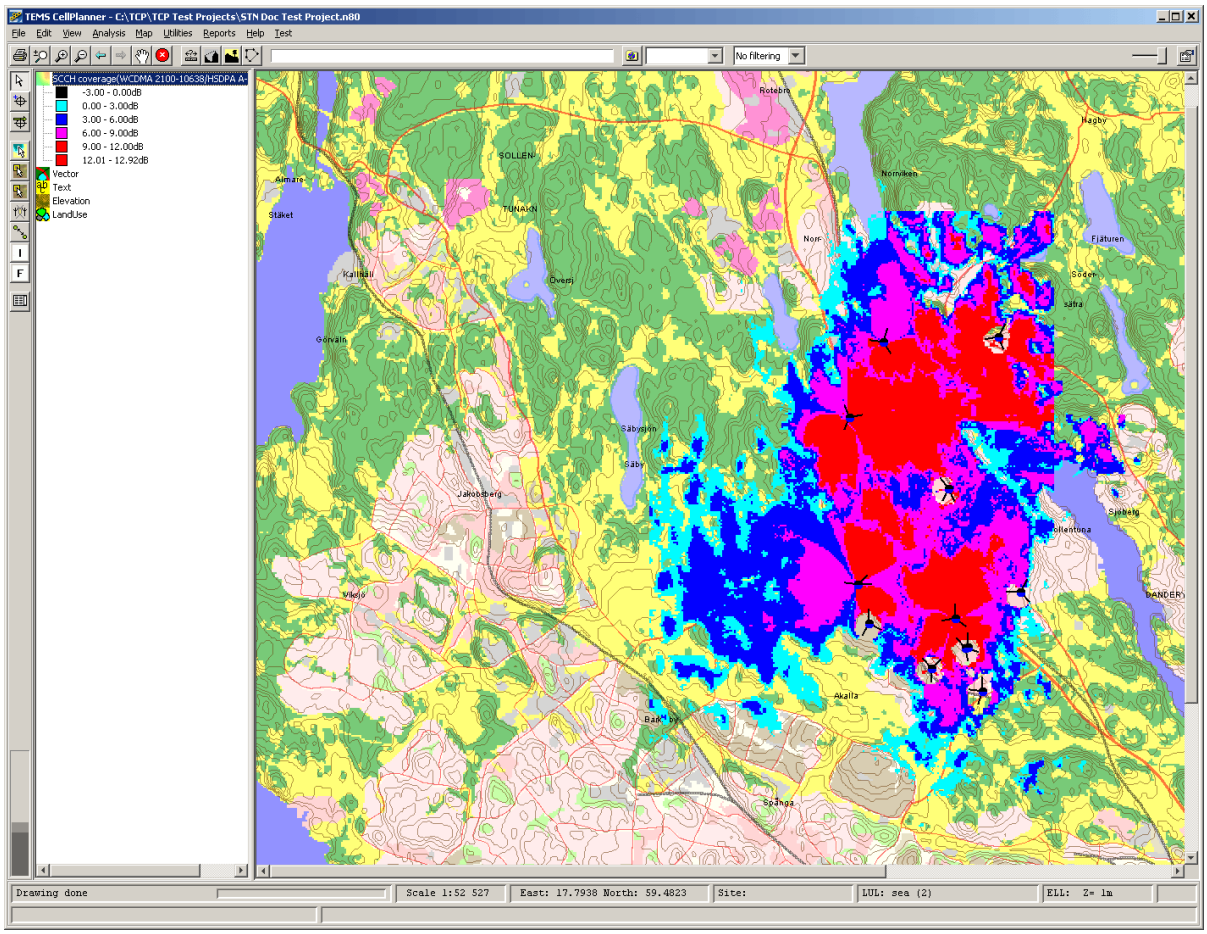
The plots related to the HS-SCCH coverage are similar to the P-CPICH plots. They display the coverage area for the HS-SCCH based on the achieved downlink Ec/Io for the HS-SCCH and in relation to the parameter **Min. DL Ec/Io for HS-SCCH** as you define.

The HS-SCCH plots are available as:

- By-cell plots, showing the best server coverage for the cell based on the HS-SCCH coverage area
- Composite plots, showing the combined HS-SCCH downlink coverage as a C/I margin above the minimum defined threshold.

Example Plot

The following is an example of the plot:



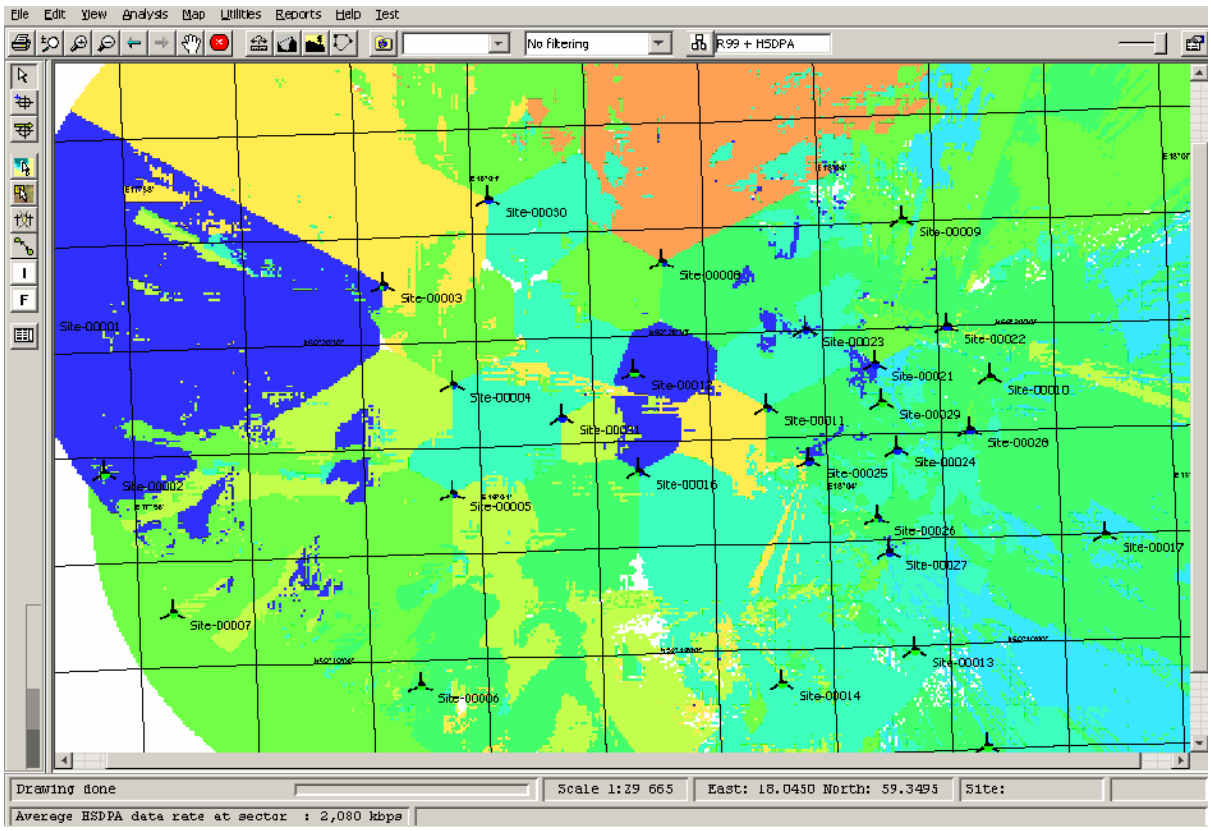
Average HSDPA Data Rate at Sector

The Average HSDPA Data Rate at Sector plot provides information on the average achieved downlink data rate on the HS-DSCH during the simulation. From this plot information on the HSDPA performance of all simulated cells in the network can be gained.

This plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the average bitrate, calculated over all random trials and all HSDPA terminals connected to the cell.

Example Plot

The following is an example of the plot:

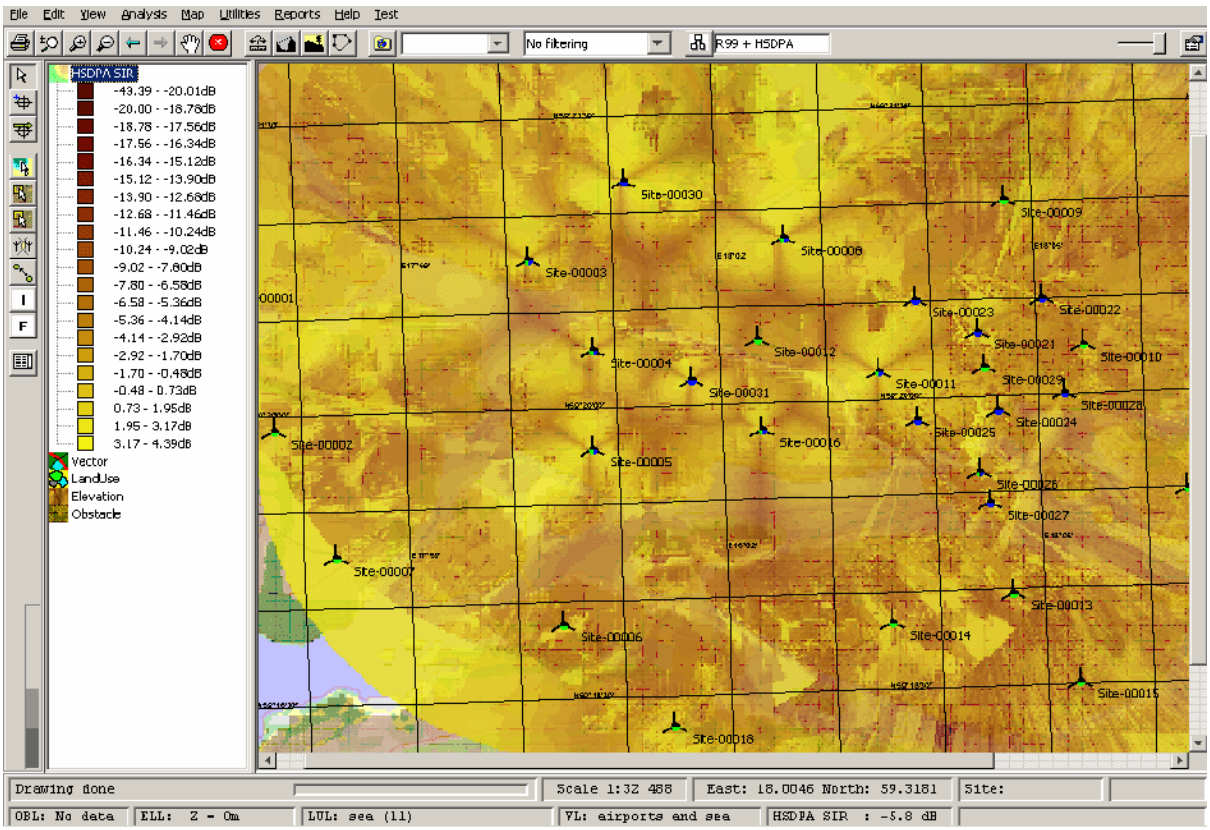


HSDPA SIR

The HSDPA SIR plot provides information on the achieved HS-DSCH downlink quality in terms of SIR. The HSDPA SIR is independent of the chosen terminal category and is input for the HSDPA bit rate calculation in any position of the network. A high SIR value allows for high peak bit rates, while low SIR values still provides HSDPA coverage but with rather low peak bit rates.

Example Plot

The following is an example of the plot:



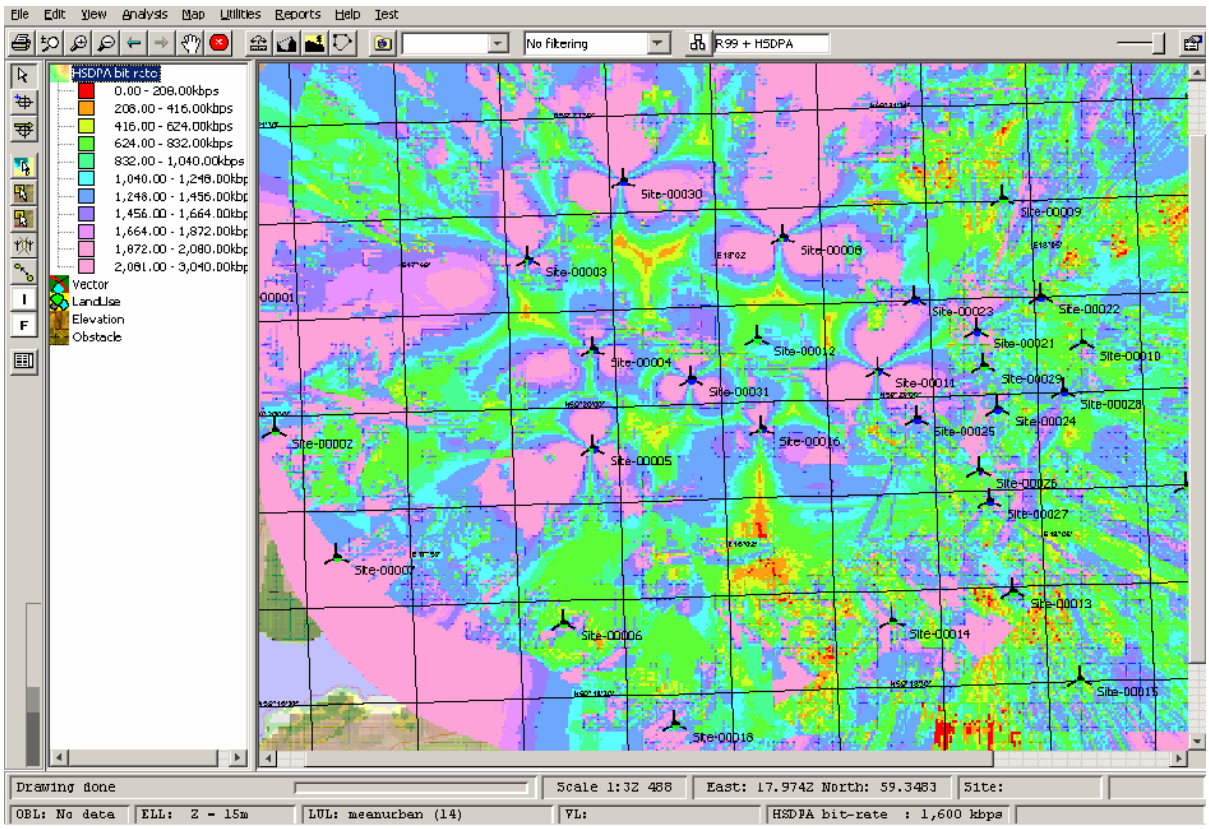
HSDPA Bit Rate

The HSDPA Bit Rate plot shows the peak bit rates that can be achieved by a certain terminal category using the corresponding A-DCH in any position in the network. The HSDPA bit rate is depending on the HSDPA SIR, on the selected terminal category as well as on the coding and modulation scheme (TFRC) that would be applied for the selected terminal category at certain HS-DSCH SIR values.

The HSDPA bit rate plot is generated by using results from link and system simulations, where achieved HS-DSCH SIR is mapped to bit rates for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 32 kbps

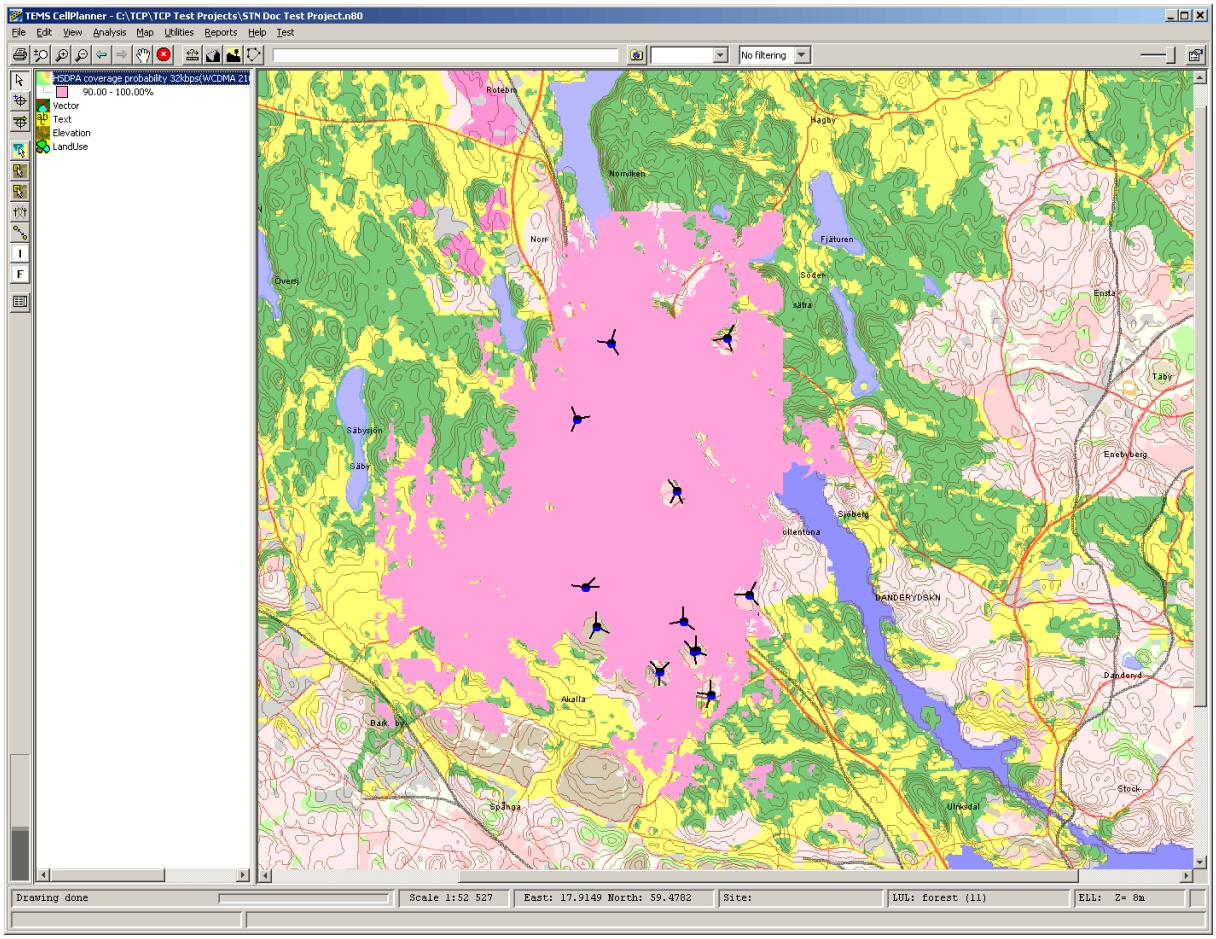
The HSDPA Coverage Probability 32 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 32 kbps derived from the HSDPA SIR values by means of a mapping curve.

Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 640 kbps

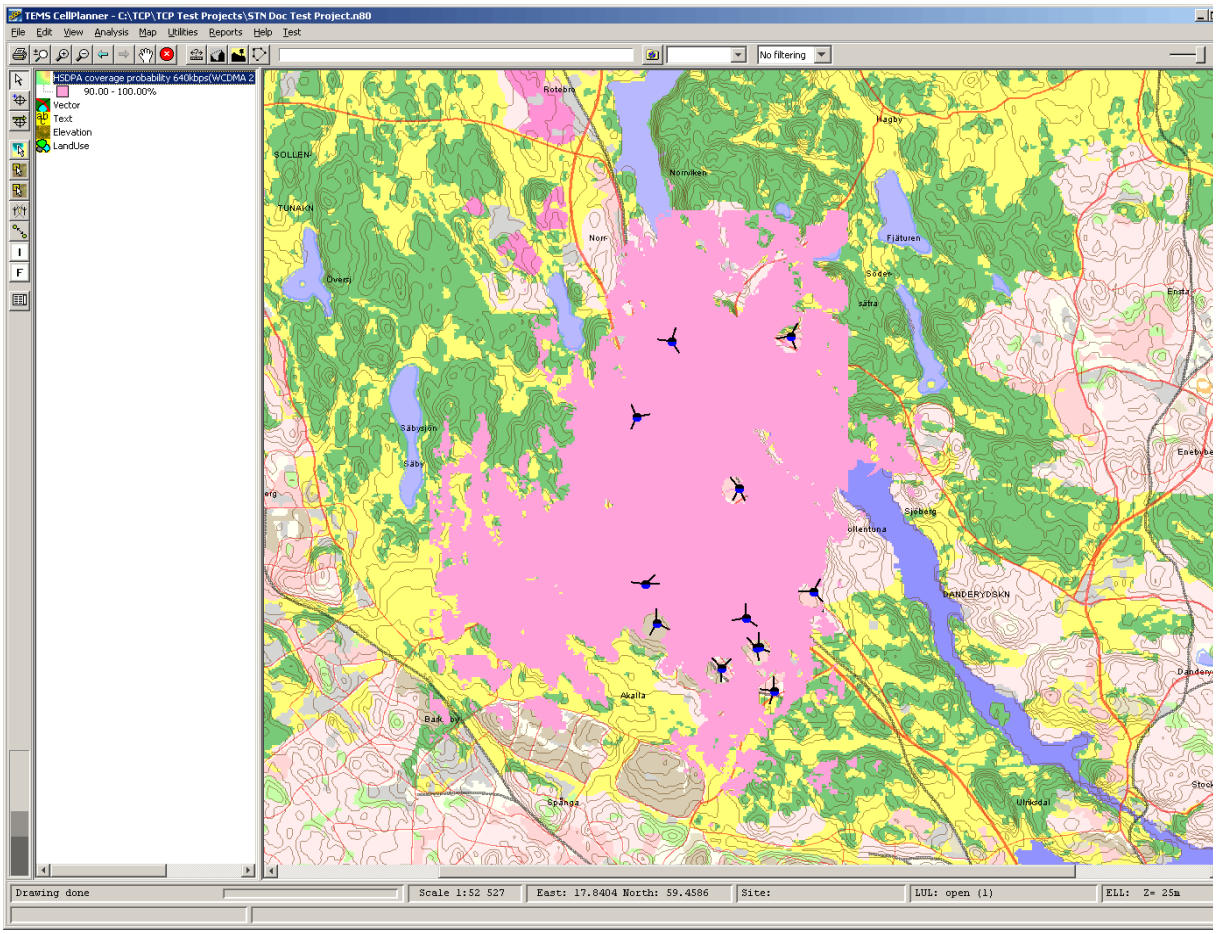
The HSDPA Coverage Probability 640 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 640 kbps derived from the HSDPA SIR values by means of a mapping curve.

Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 800 kbps

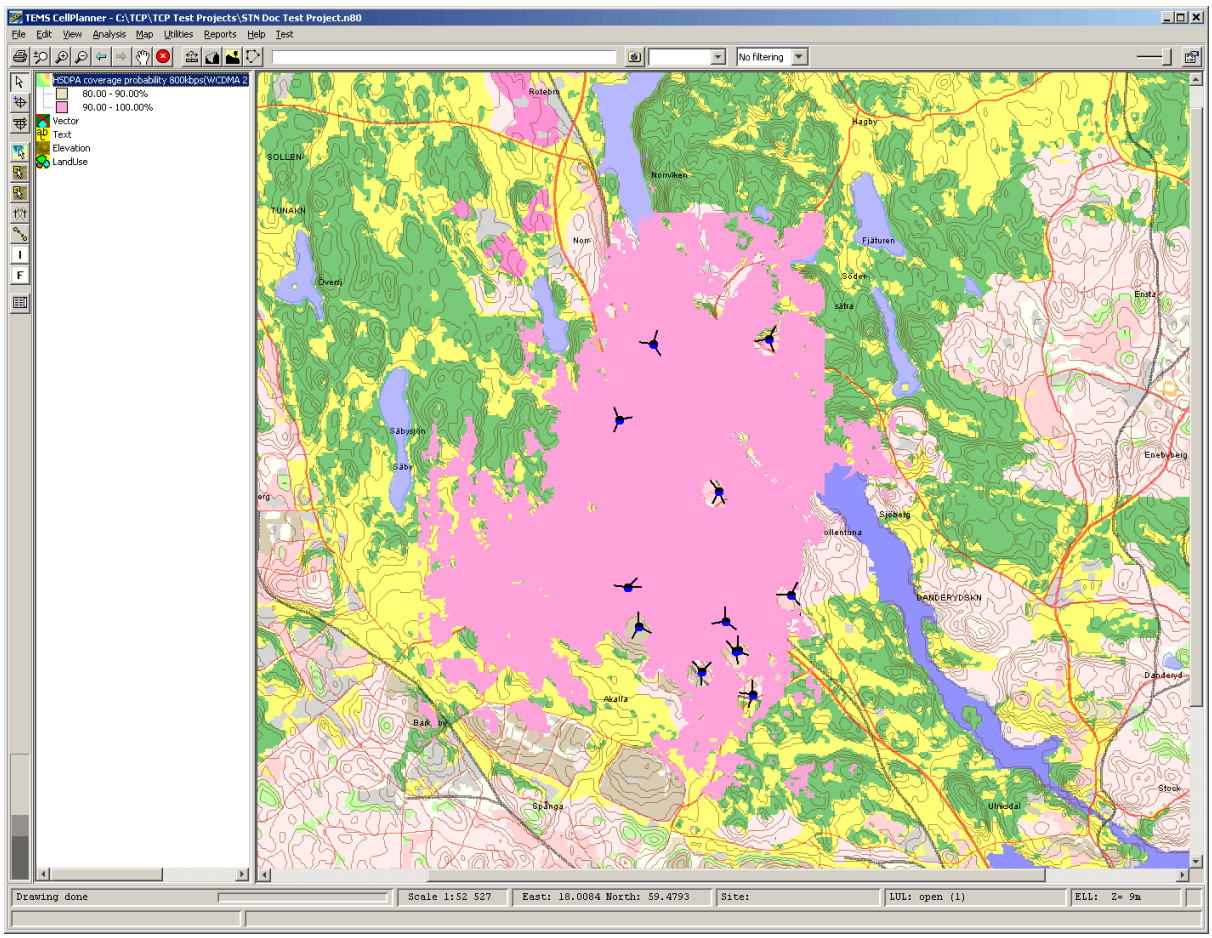
The HSDPA Coverage Probability 800 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 800 kbps derived from the HSDPA SIR values by means of a mapping curve.

Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 1280 kbps

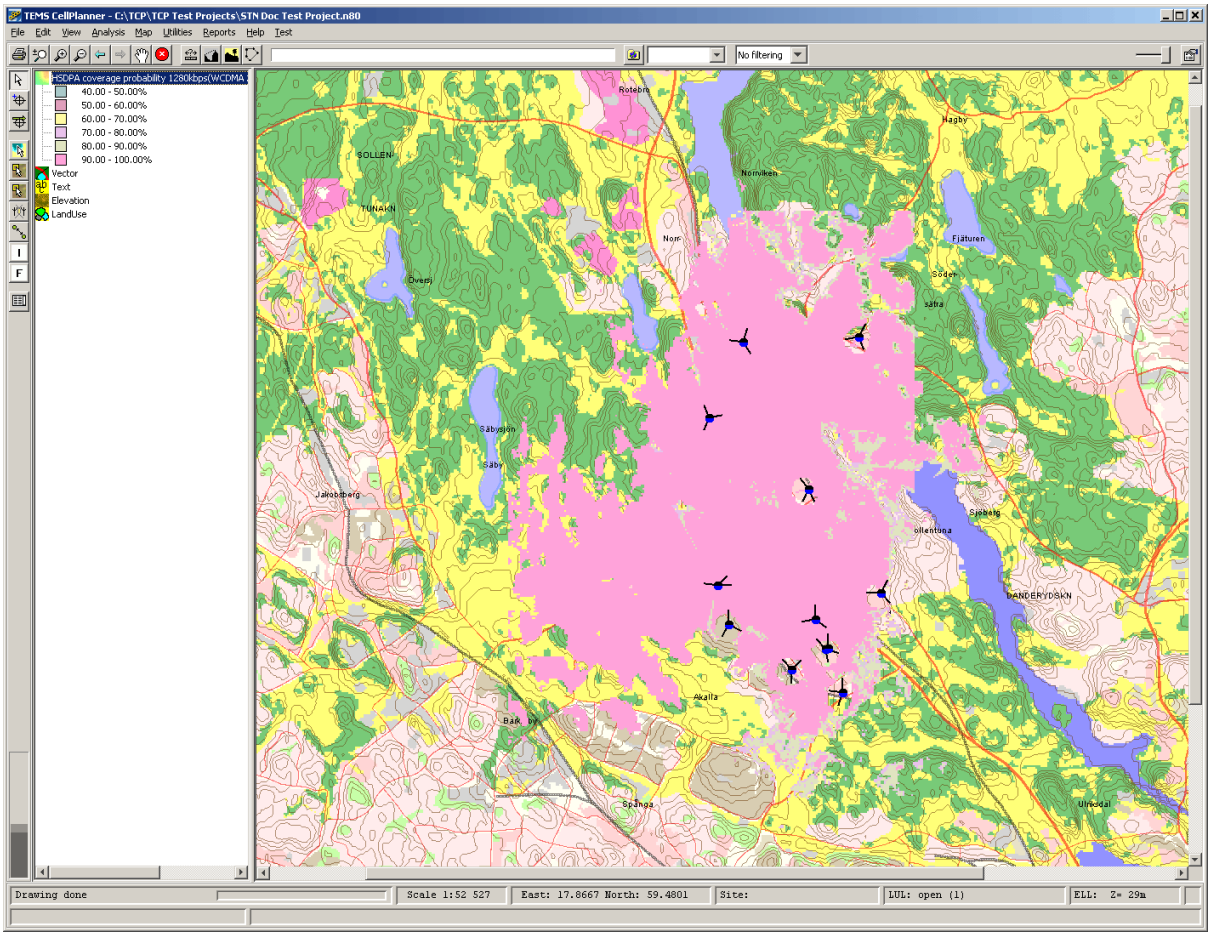
The HSDPA Coverage Probability 1280 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 1280 kbps that are derived from the HSDPA SIR values by means of a mapping curve.

This plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 2400 kbps

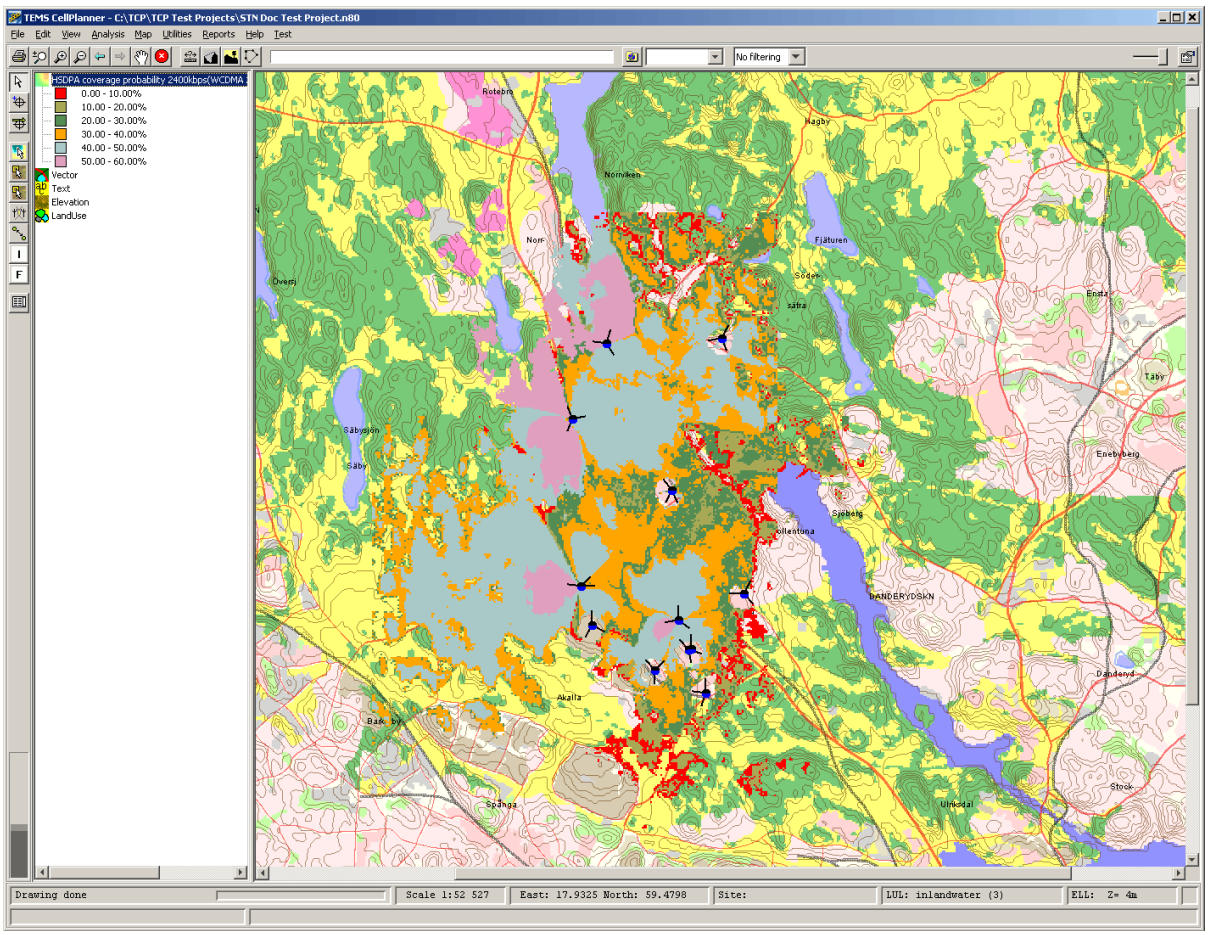
The HSDPA Coverage Probability 2400 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 2400 kbps derived from the HSDPA SIR values by means of a mapping curve.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 3680 kbps

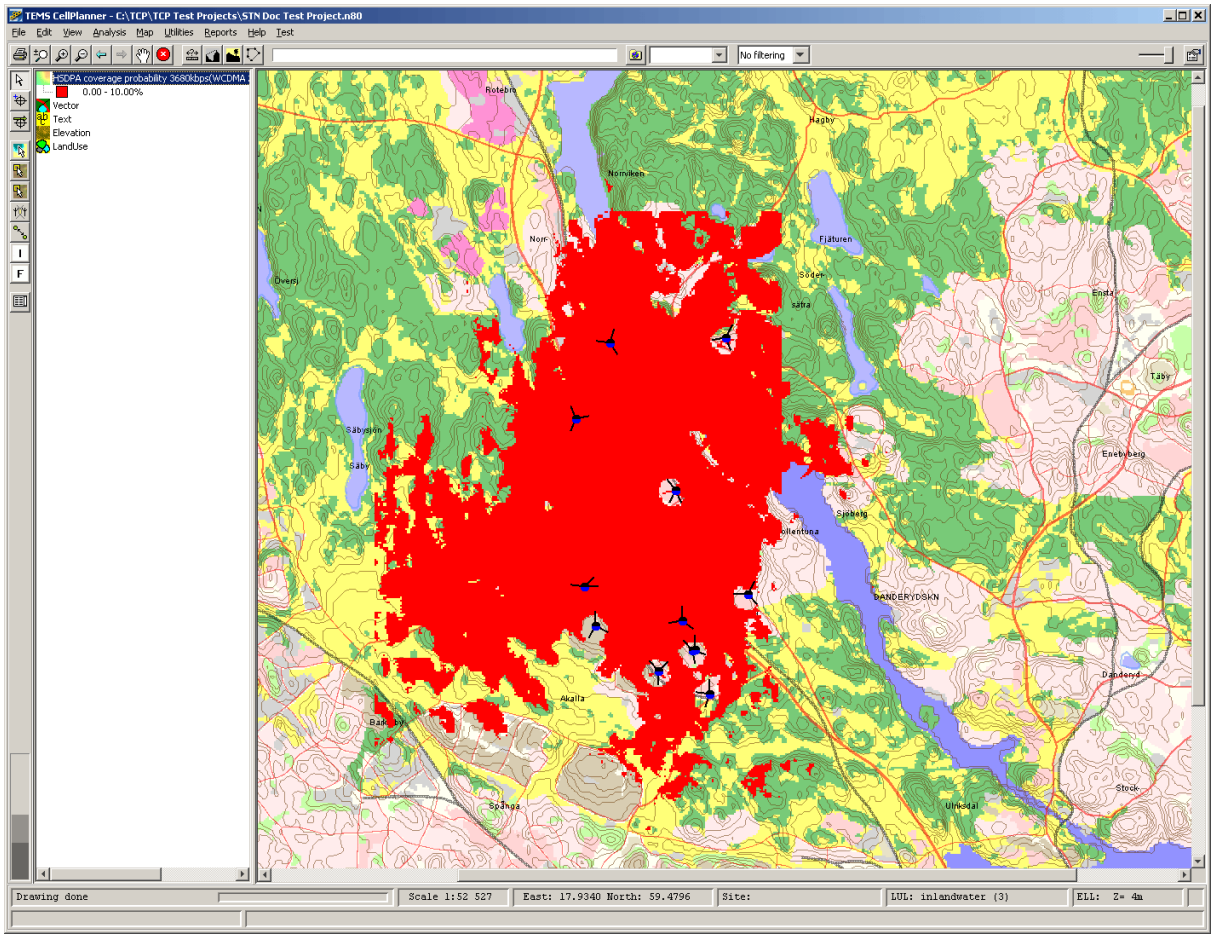
The HSDPA Coverage Probability 3680 kbps plot provides information on the probability of achieving a specified HS-DSCH peak bit rate in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit-rate of 3680 kbps that are derived from the HSDPA SIR values by means of a mapping curve.

Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 7200 kbps

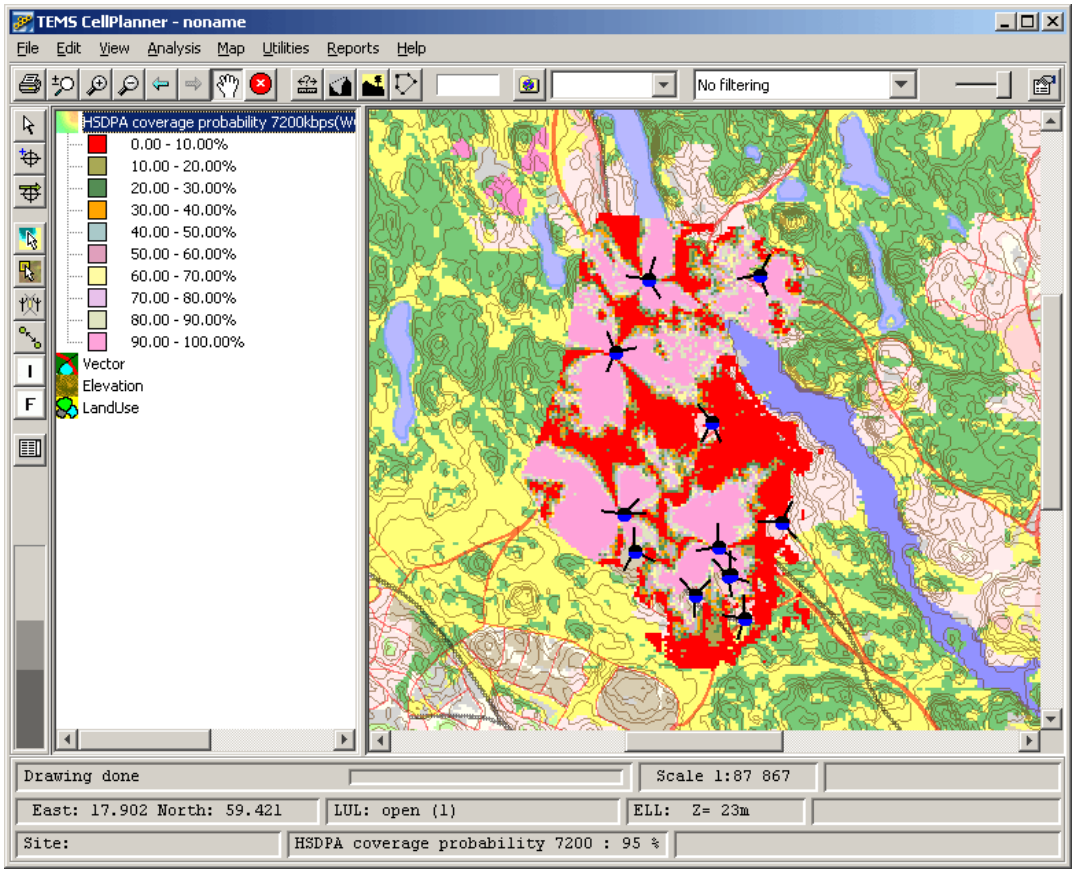
The HSDPA Coverage Probability 7200 kbps plot provides information on the probability of achieving an HS-DSCH peak bit rate of 7200 kbps in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit rate of 7200 kbps that are derived from the HSDPA SIR values. Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

To generate this plot, the traffic mix must include an HSDPA A-DCH bearer with an HSDPA terminal of category 7, 8, 9 or 10. The cells should have a non-orthogonality around 0,03 dBm, a CPICH power of 28 dBm, and the analysis should not include any fading margin.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 14400 kbps

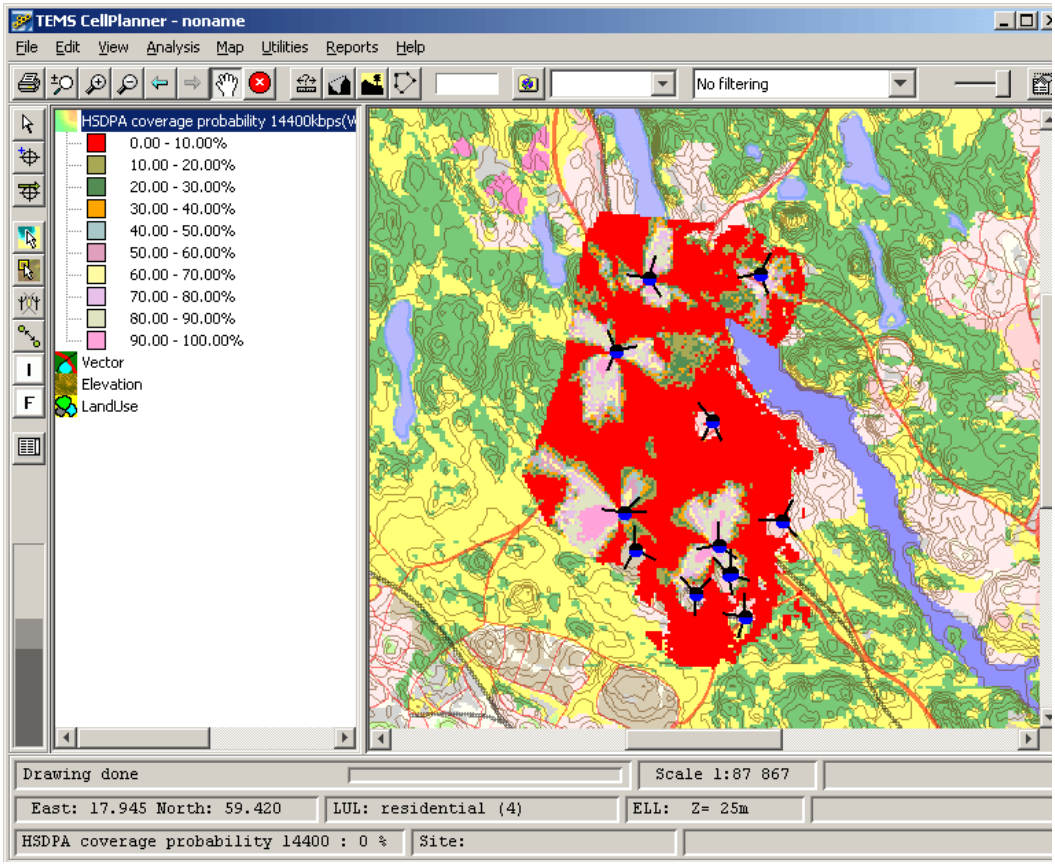
The HSDPA Coverage Probability 14400 kbps plot provides information on the probability of achieving an HS-DSCH peak bit rate of 14400 kbps in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit rate of 14400 kbps that are derived from the HSDPA SIR values. Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

To generate this plot, the traffic mix must include an HSDPA A-DCH bearer with an HSDPA terminal of category 10. The cells should have a non-orthogonality around 0,03 dBm, a CPICH power of 28 dBm, and the analysis should not include any fading margin.

Example Plot

The following is an example of the plot:



HSDPA Coverage Probability 21100 kbps

The HSDPA Coverage Probability 21100 kbps plot provides information on the probability of achieving an HS-DSCH peak bit rate of 21100 kbps in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit rate of 21100 kbps that are derived from the HSDPA SIR values. Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

To generate this plot, the traffic mix must include an HSDPA bearer with an HSDPA terminal of category 13 to 18 supporting the HSDPA bearer, both enabled for Evolved HSPA. The cells must support 64 QAM downlink modulation. The cells should have a non-orthogonality around 0.001, a PCPICH power around 30 dBm (less than 5% of total tx power), and the analysis should not include any fading margin.

HSDPA Coverage Probability 28000 kbps

The HSDPA Coverage Probability 28000 kbps plot provides information on the probability of achieving an HS-DSCH peak bit rate of 28000 kbps in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit rate of 28000 kbps that are derived from the HSDPA SIR values. Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

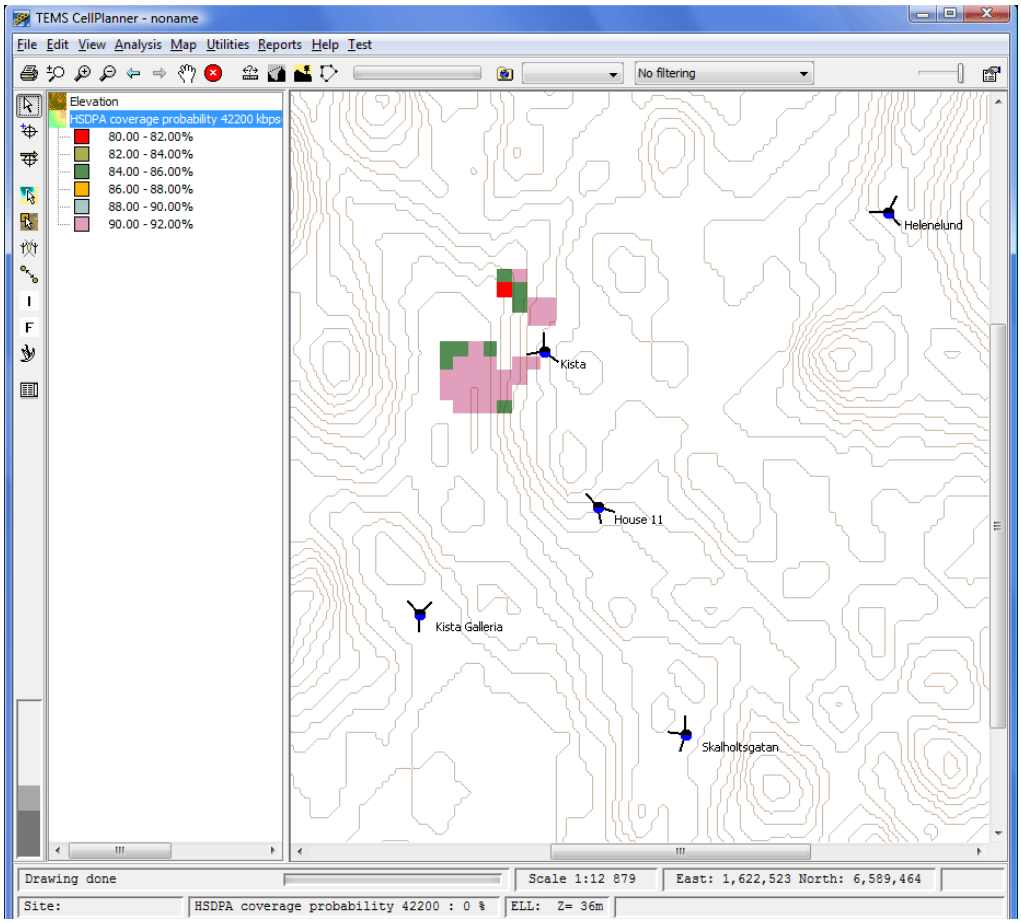
To generate this plot, the traffic mix must include an HSDPA bearer with an HSDPA terminal of category 17 or 18 supporting the HSDPA bearer, both enabled for Evolved HSPA. The cells must be configured for 2 tx antennas and support 2x2 MIMO with maximal (100 dB) cross-channel attenuation. The cells should have a non-orthogonality around 0.001, a PCPICH power around 30 dBm (less than 5% of total tx power), and the analysis should not include any fading margin.

HSDPA Coverage Probability 42200 kbps

The HSDPA Coverage Probability 42200 kbps plot provides information on the probability of achieving an HS-DSCH peak bit rate of 42200 kbps in any position in the network.

This plot shows, color encoded for every bin, the HSDPA coverage probability values for a bit rate of 42200 kbps that are derived from the HSDPA SIR values. Similarly to the HSDPA bit rate plot, this plot is generated by using results from link and system simulations, where achieved HSDSCH SIR is mapped to coverage probabilities for different terminal categories.

To generate this plot, the traffic mix must include an HSDPA bearer and an HSDPA terminal of category 20 supporting the HSDPA bearer, both enabled for Evolved HSPA. The cells must be enabled for Evolved HSPA, configured for 2 tx antennas, support 2x2 MIMO and 64 QAM, and have a cross channel attenuation of 100 dB (maximal attenuation). The cells should have a non-orthogonality around 0.001, max Tx power DL set to 50 dBm (maximal power), a low CPICH power around 10 dBm, and the analysis should not include any fading margin. With these settings a coverage probability of ~90% can be obtained, as in the example below with one cell enabled for evolved HSPA:



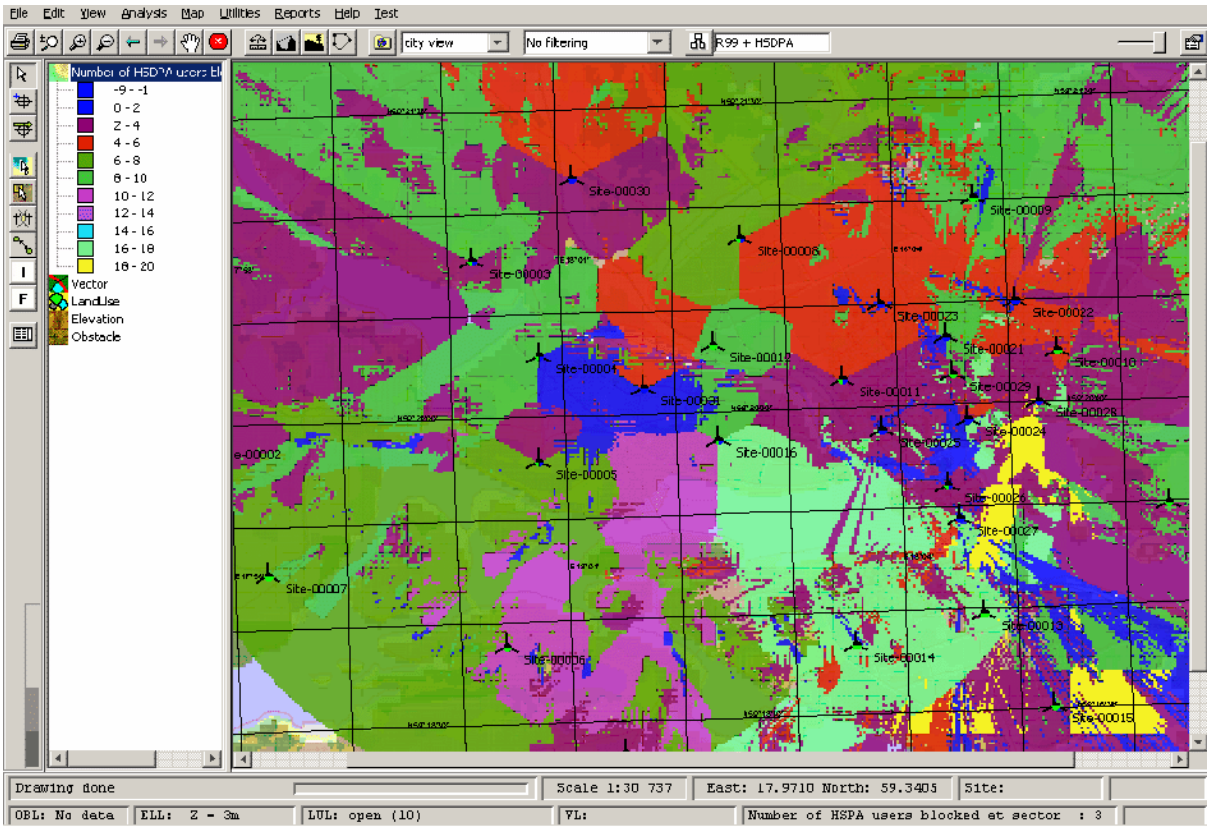
Number of HSDPA Users Blocked at Sector

The Number of HSDPA Users Blocked at Sector plot shows statistical information in terms of average number of HSDPA users blocked at a sector over all trials of the simulation.

This plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the average number of HSDPA users blocked in the cell due to the upper limit on the number of HSDPA users, calculated over all random trials.

Example Plot

The following is an example of the plot:



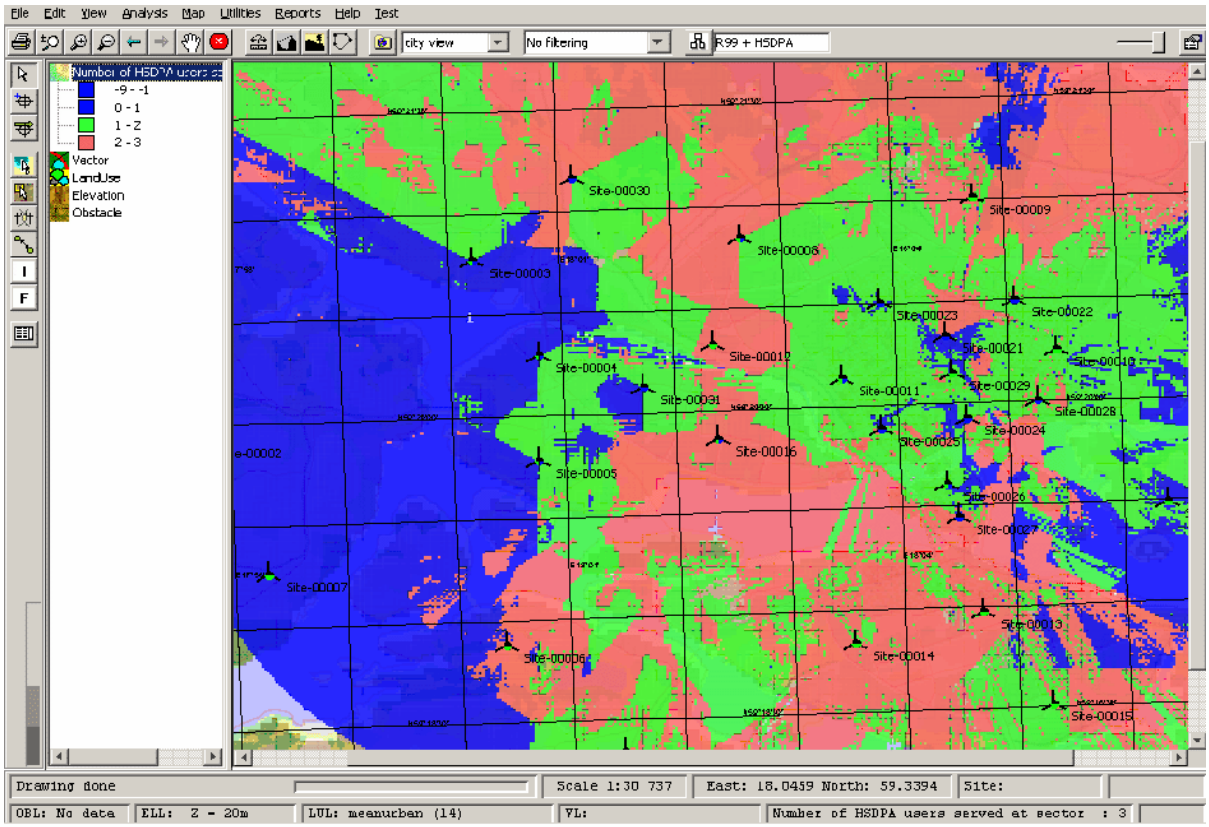
Number of HSDPA Users Served at Sector

The Number of HSDPA Users Served at Sector plot shows statistical information in terms of average number of HSDPA users served at a sector over all trials of the simulation.

This plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the average number of served HSDPA users in the cell, calculated over all random trials.

Example Plot

The following is an example of the plot:



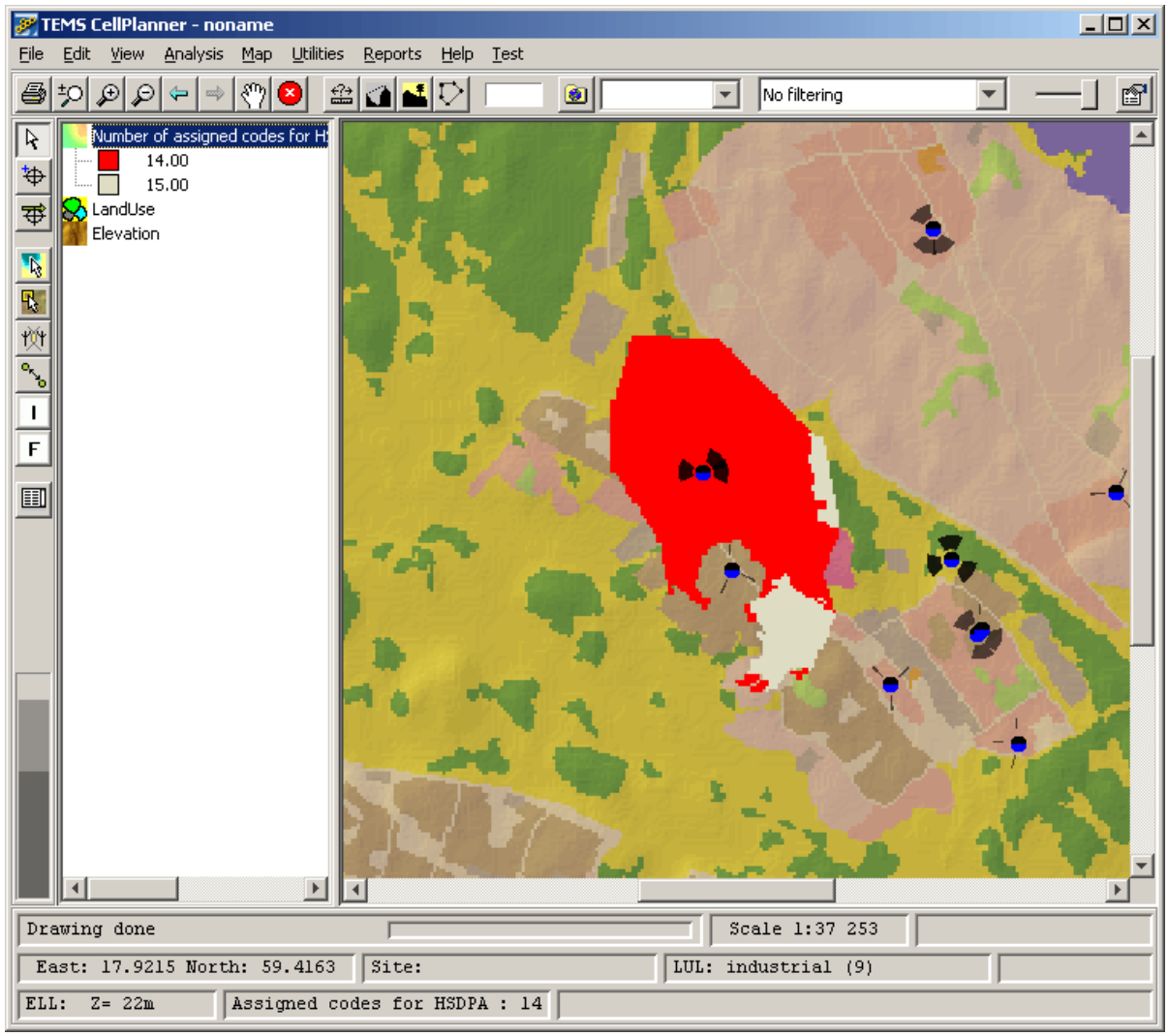
Number of Assigned Codes for HSDPA

The Number of Assigned Codes for HSDPA plot shows the number of assigned HSDPA codes with SF 16.

This plot is generated only when a Monte Carlo simulation is performed with Flexible Scheduler and Dynamic Code Allocation selected. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the number of HSDPA codes assigned in the cell, calculated over all random trials.

Example Plot

The following is an example of the plot:



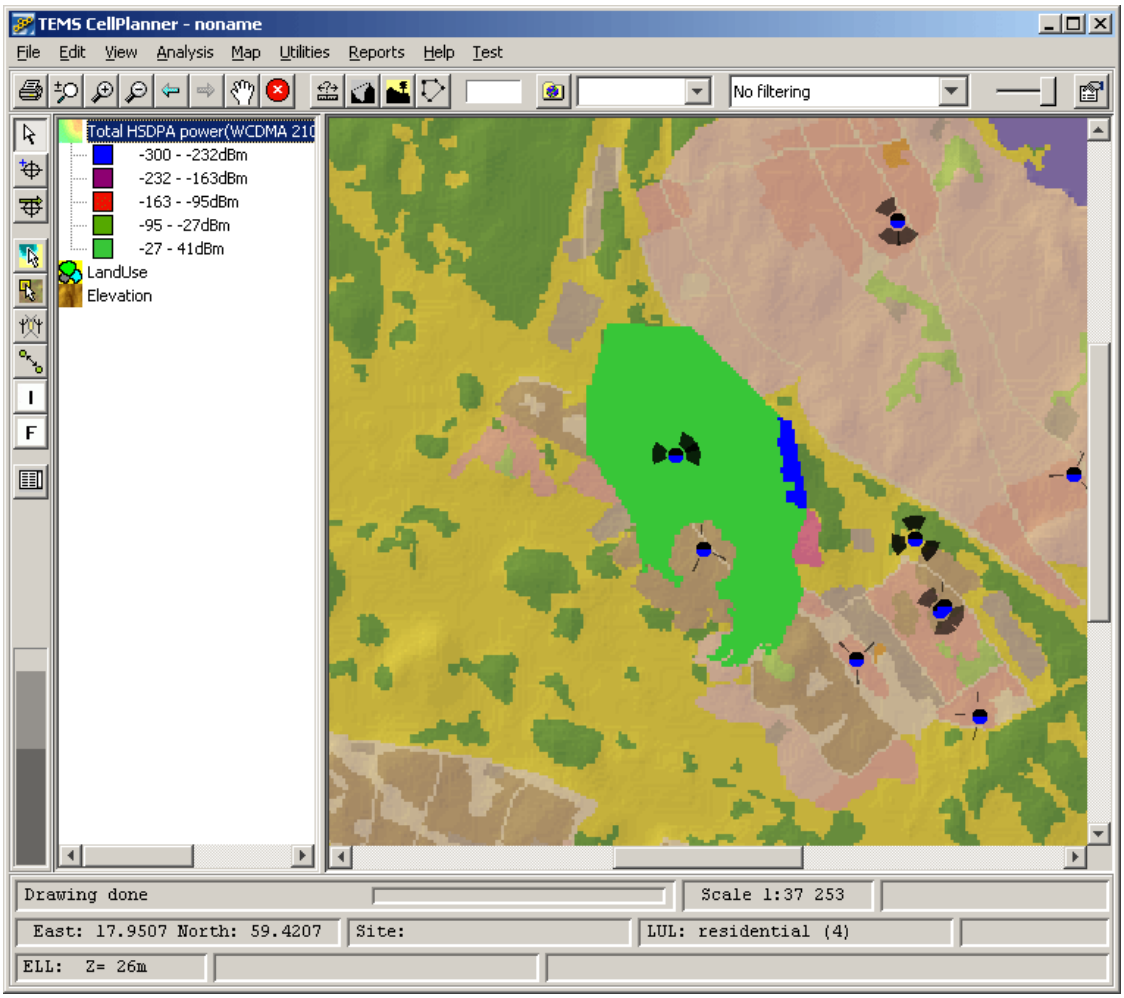
Total HSDPA Power

The HSDPA Power plot shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the total HSDPA power allocated to the cell, either by the user in the cell window or by the program (calculated over all random trials in a Monte Carlo simulation). The value is used as input to the HSDPA SIR calculation.

This plot indicates the cells that have a certain power level available for high peak bit rates on HSDPA.

Example Plot

The following shows an example of the plot:



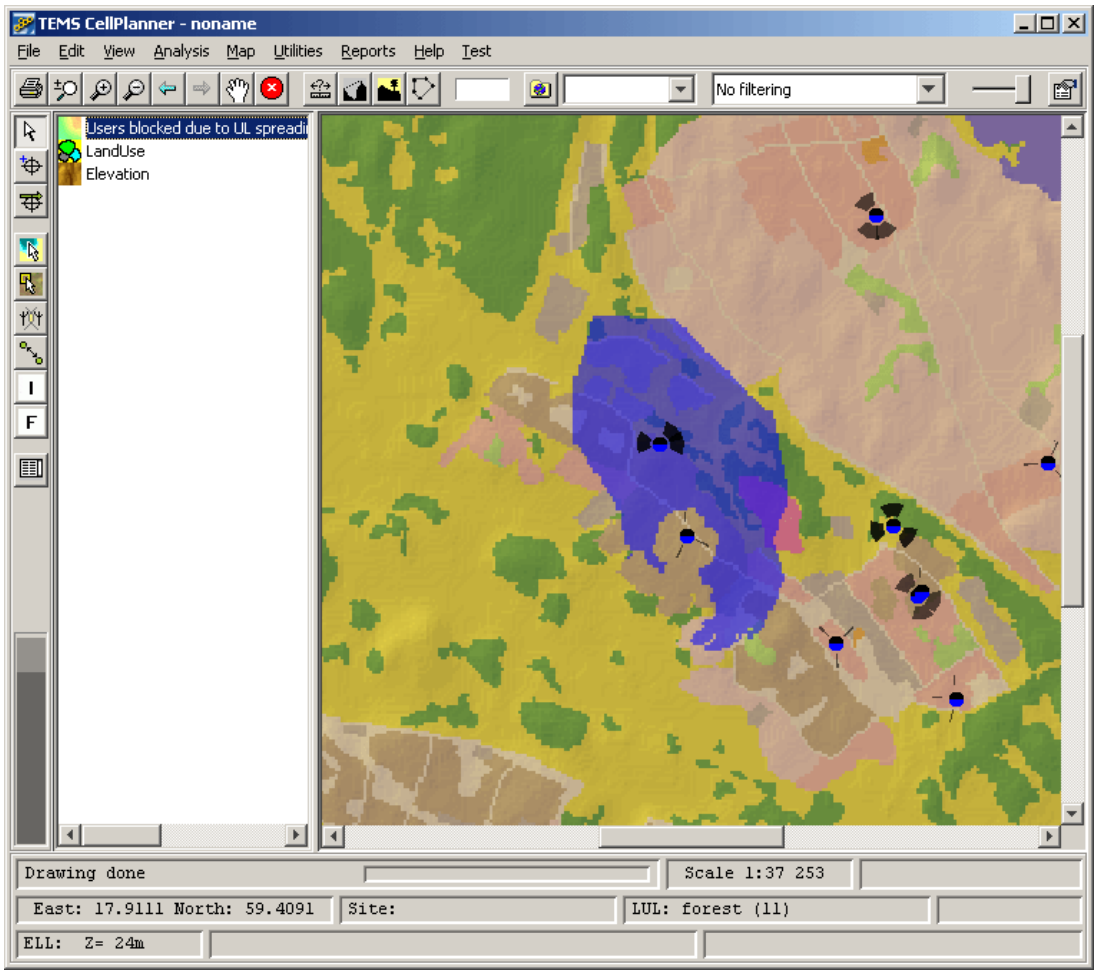
Users Blocked Due to Uplink Spreading Factor 4

The Users Blocked Due to Uplink Spreading Factor 4 Overload plot shows statistical information in terms of average HSDPA users blocked for a cell over all trials of the simulation. The blocking reason is that the limit for the cell specific HSDPA parameter Max. no. of SF=4 users on uplink has been exceeded for that cell.

The plot is generated only when a Monte Carlo simulation is performed. It shows one color encoded value for every cell in all bins in the cell's best server area. The value represents the number of HSDPA users that are blocked in the cell due to the upper limit on the number of users with SF = 4 in the uplink, calculated over all random trials.

Example Plot

The following shows an example of the plot where no users are blocked:



MBMS Plots

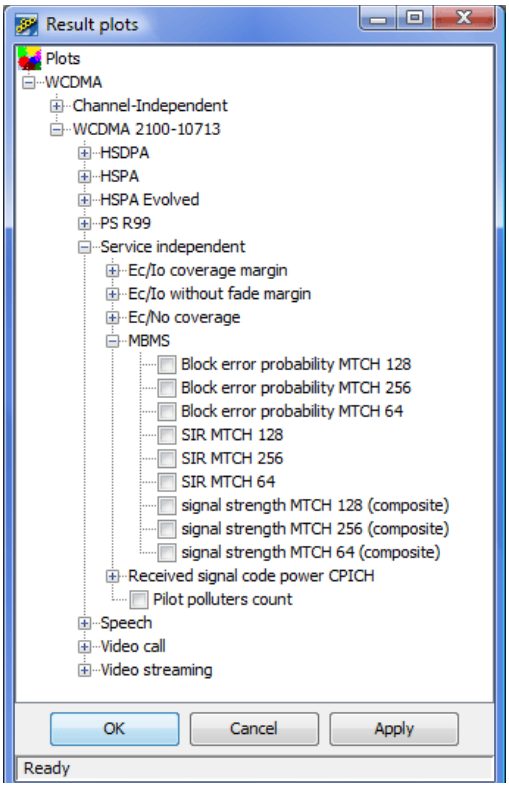
The result from WCDMA Analysis can be displayed as service independent MBMS plots, generated per frequency if all of these conditions are fulfilled:

- MBMS is enabled in the **cells**
- Option **MBMS** is selected for the **WCDMA analysis**
- Option **Service independent plots** is enabled for the **WCDMA analysis**

The MBMS plots listed below can be generated:

- Signal Strength MTCH 64
- Signal Strength MTCH 128
- Signal Strength MTCH 256
- SIR MTCH 64
- SIR MTCH 128
- SIR MTCH 256
- Block Error Probability MTCH 64
- Block Error Probability MTCH 128
- Block Error Probability MTCH 256

The result plots window opened from **Analysis↗Result plots...** or the icon might look as in the following example including MBMS plots:



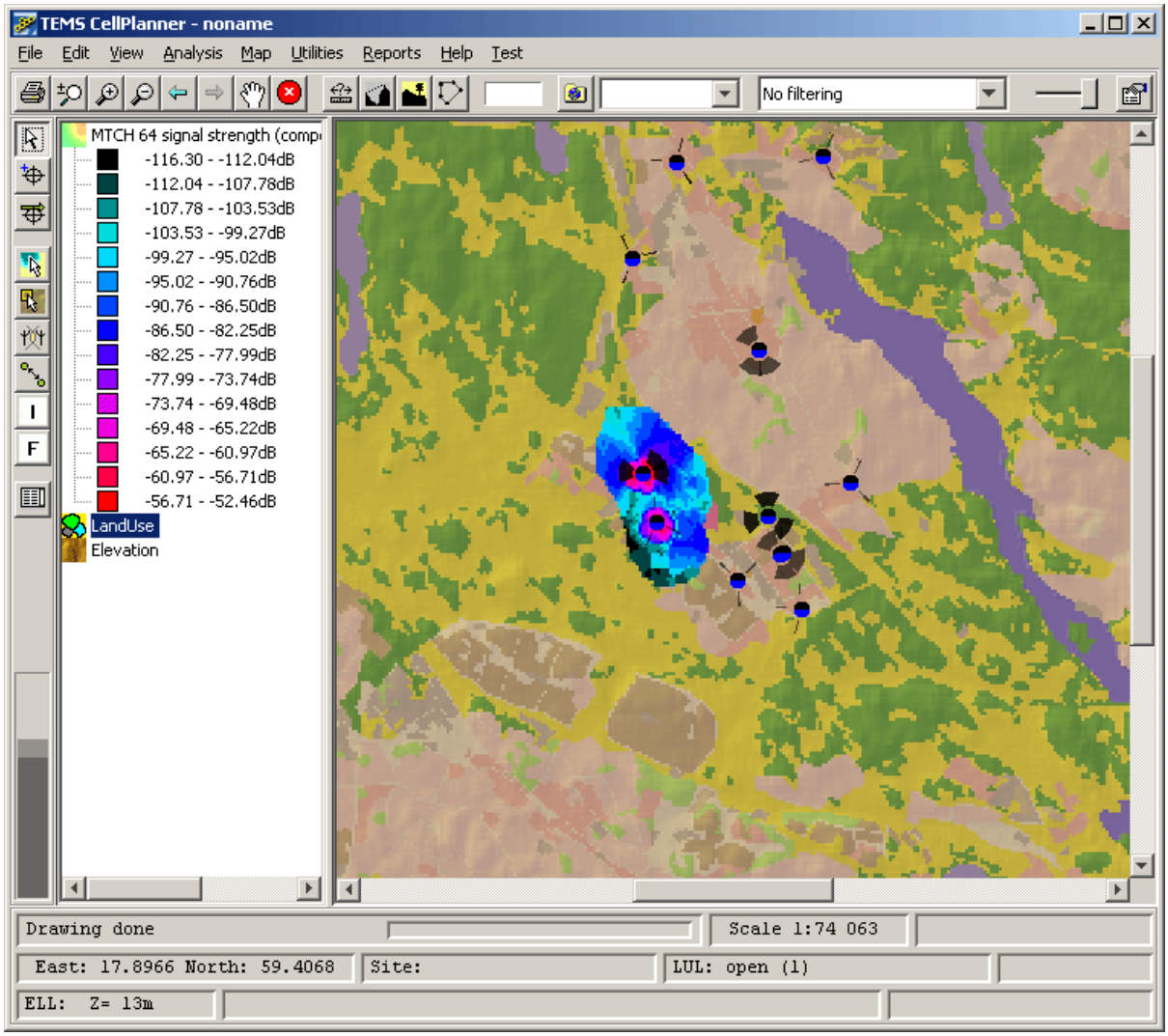
The subsequent pages describe and exemplify the MBMS plots.

Signal Strength MTCH 64

The Signal Strength MTCH 64 plot shows the composite signal strength calculated from the transmitted power and the pathloss. The result is presented color coded per bin.

Example Plot

The following example shows the Signal Strength MTCH 64 plot:

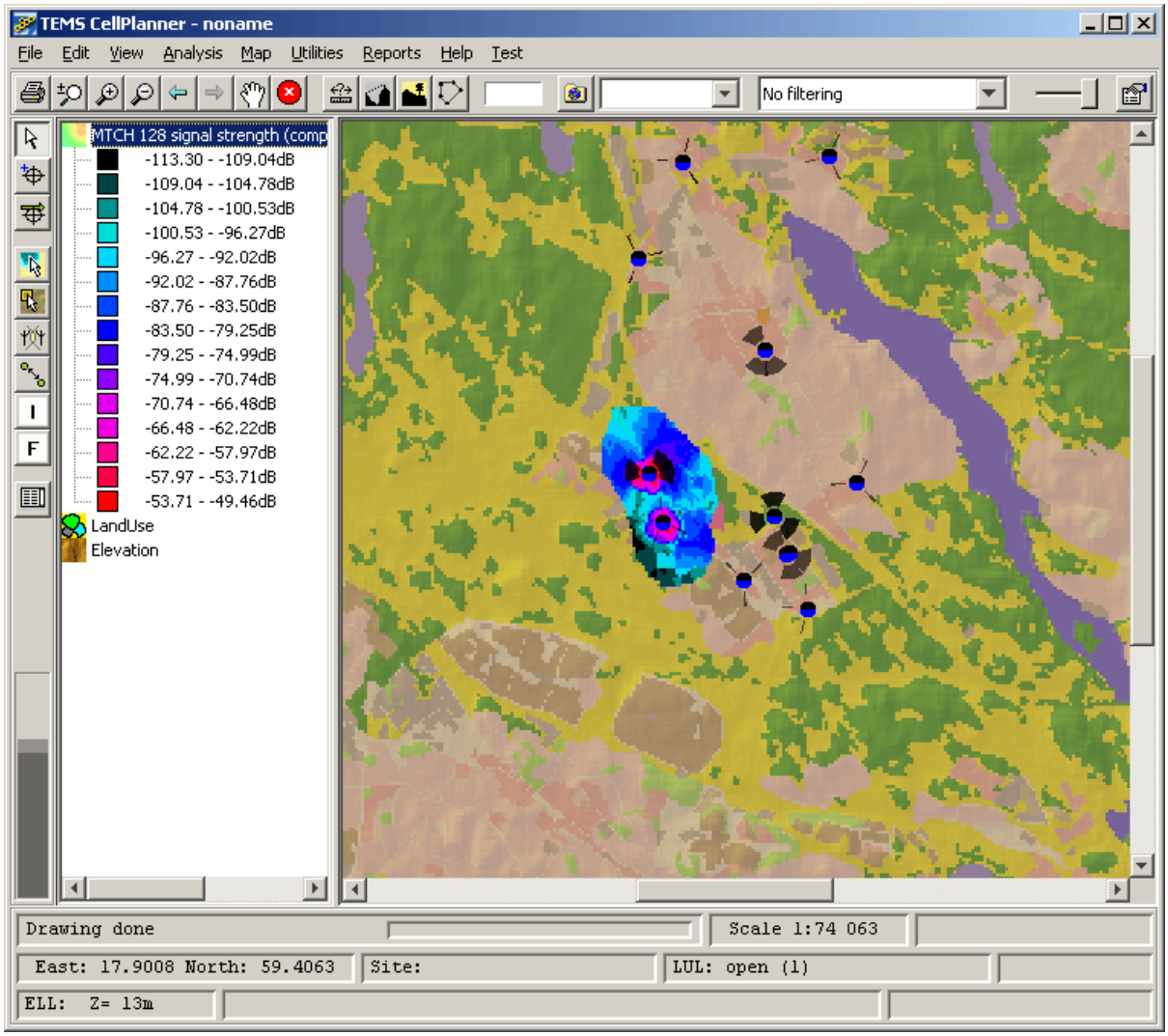


Signal Strength MTCH 128

The Signal Strength MTCH 128 plot shows the composite signal strength calculated from the transmitted power and the pathloss. The result is presented color coded per bin.

Example Plot

The following example shows the Signal Strength MTCH 128 plot:

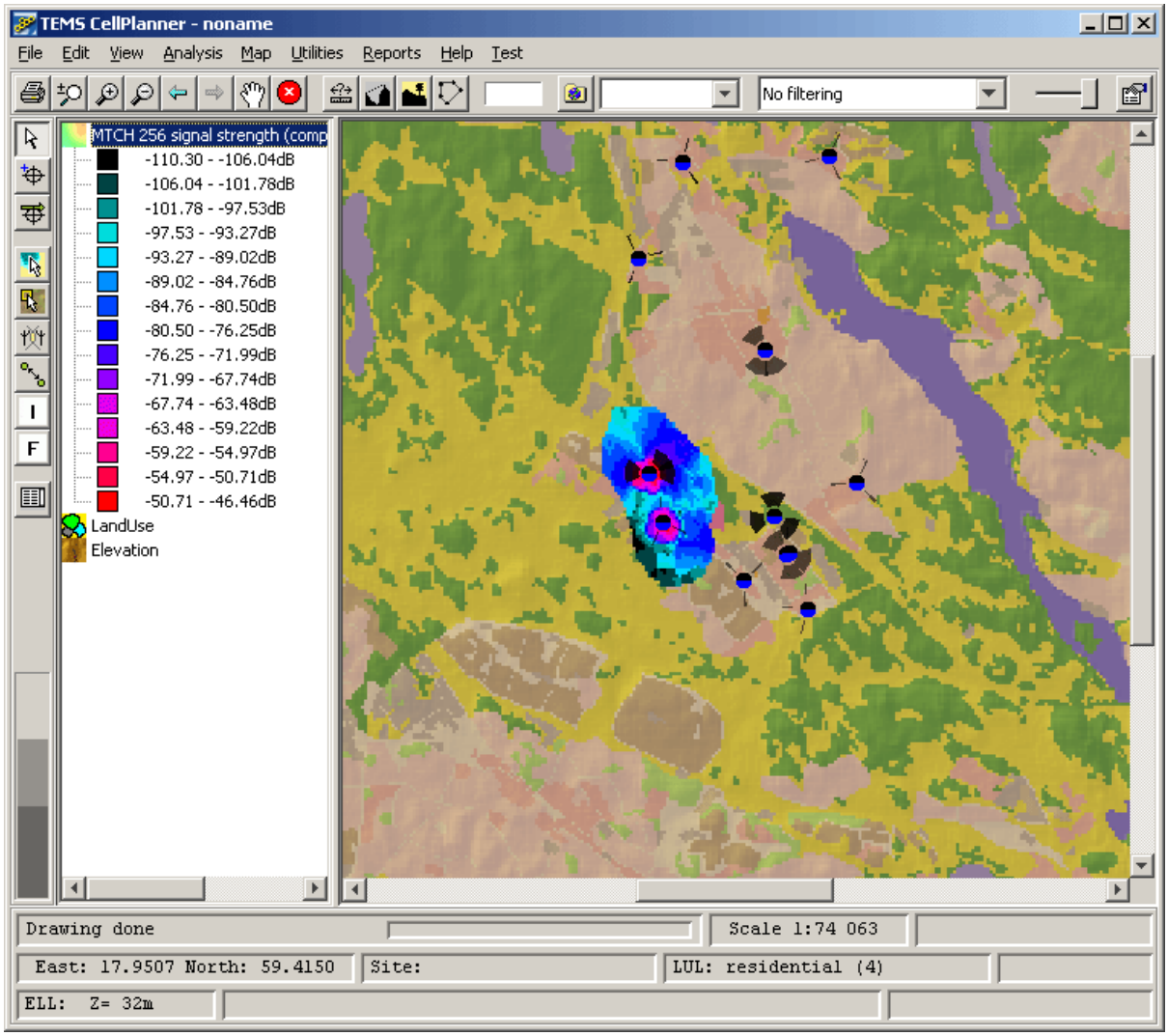


Signal Strength MTCH 256

The Signal Strength MTCH 256 plot shows the composite signal strength calculated from the transmitted power and the pathloss. The result is presented color coded per bin.

Example Plot

The following example shows the Signal Strength MTCH 256 plot:

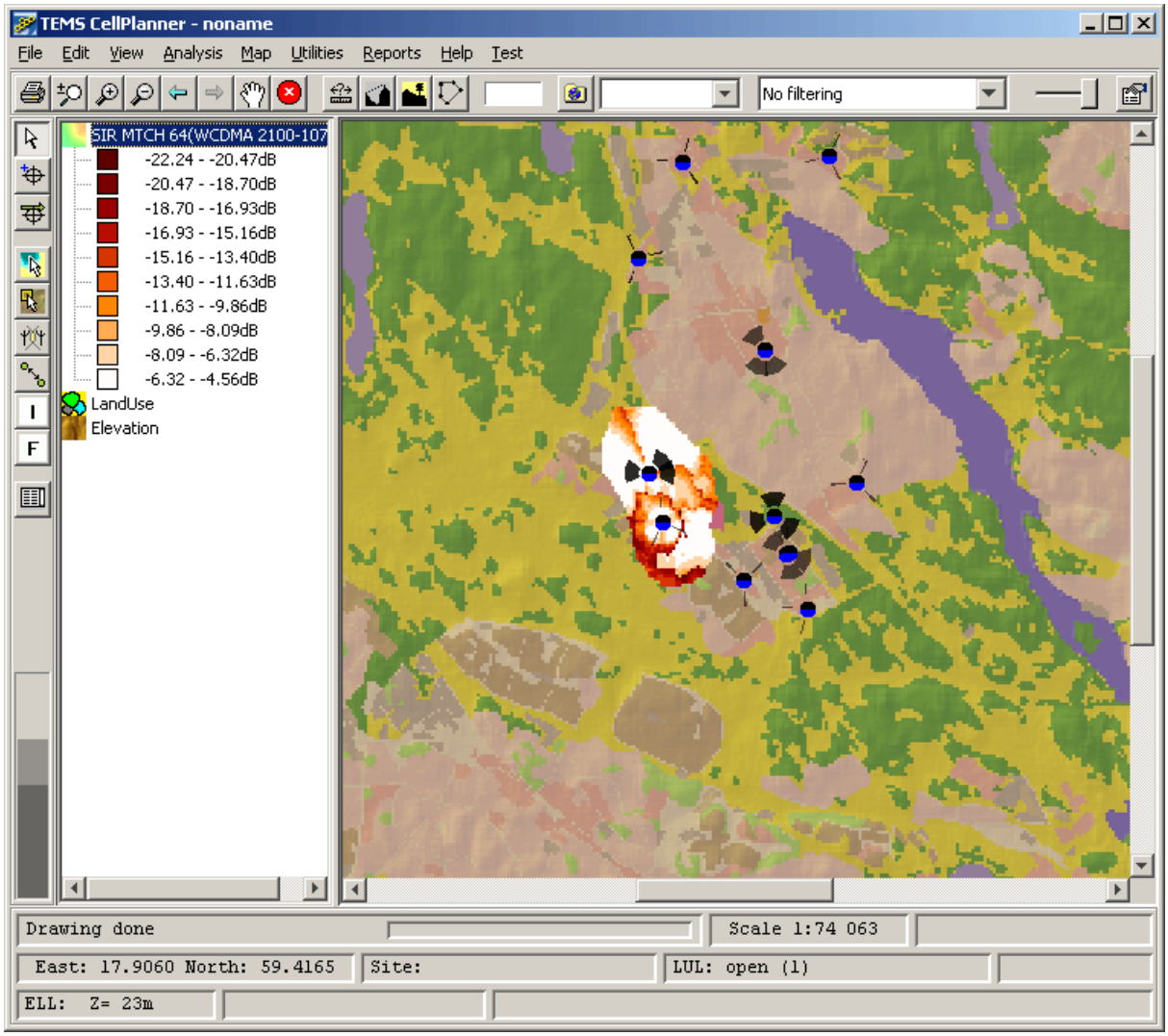


SIR MTCH 64

The SIR MTCH 64 plot shows the signal to interference ratio (SIR) values derived from the signal strength and the calculated interference values. The result is presented color coded per bin.

Example Plot

The following example shows the SIR MTCH 64 plot:

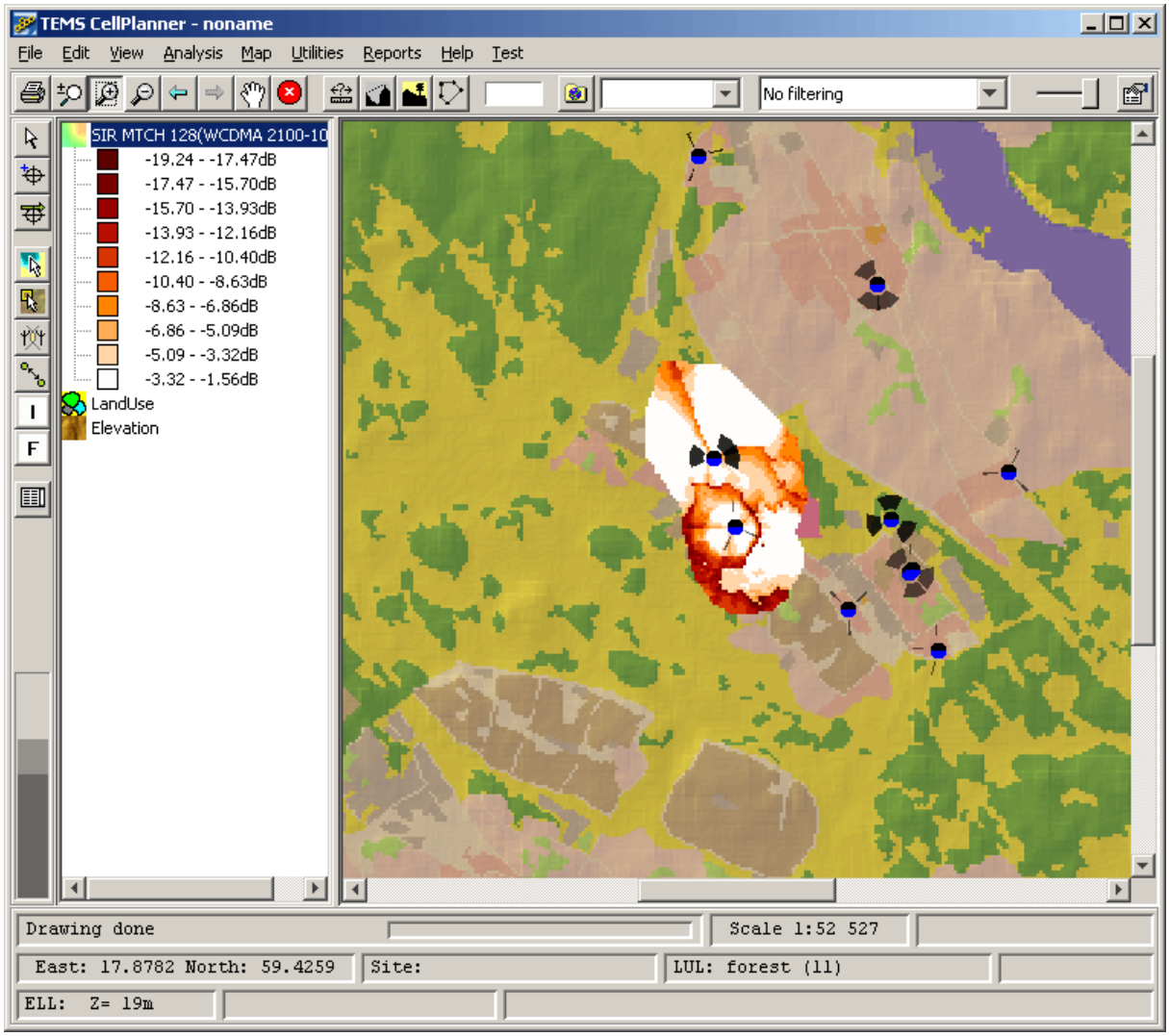


SIR MTCH 128

The SIR MTCH 128 plot shows the signal to interference ratio (SIR) values derived from the signal strength and the calculated interference values. The result is presented color coded per bin.

Example Plot

The following example shows the SIR MTCH 128 plot:

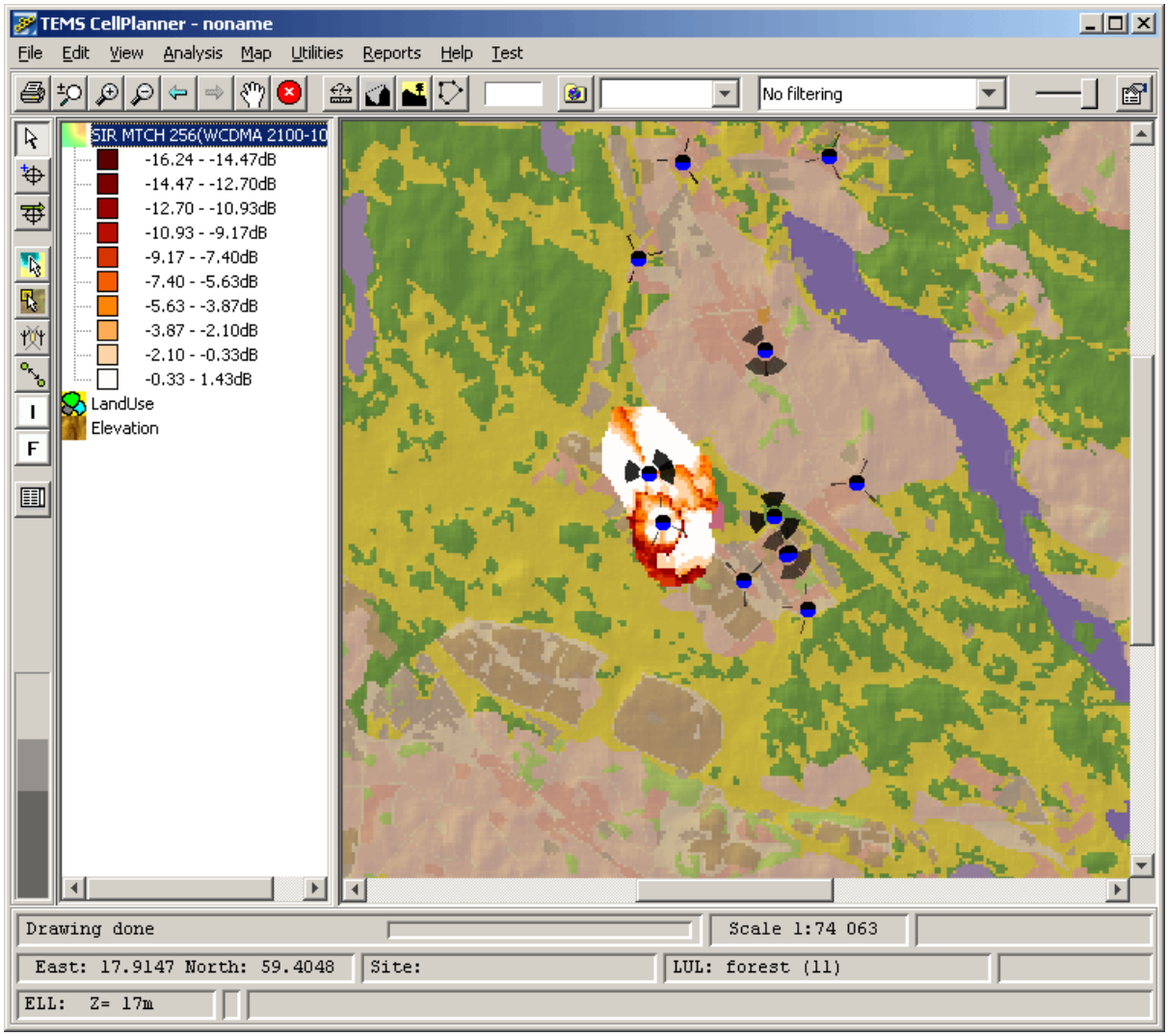


SIR MTCH 256

The SIR MTCH 256 plot shows the signal to interference ratio (SIR) values derived from the signal strength and the calculated interference values. The result is presented color coded per bin.

Example Plot

The following example shows the SIR MTCH 256 plot:

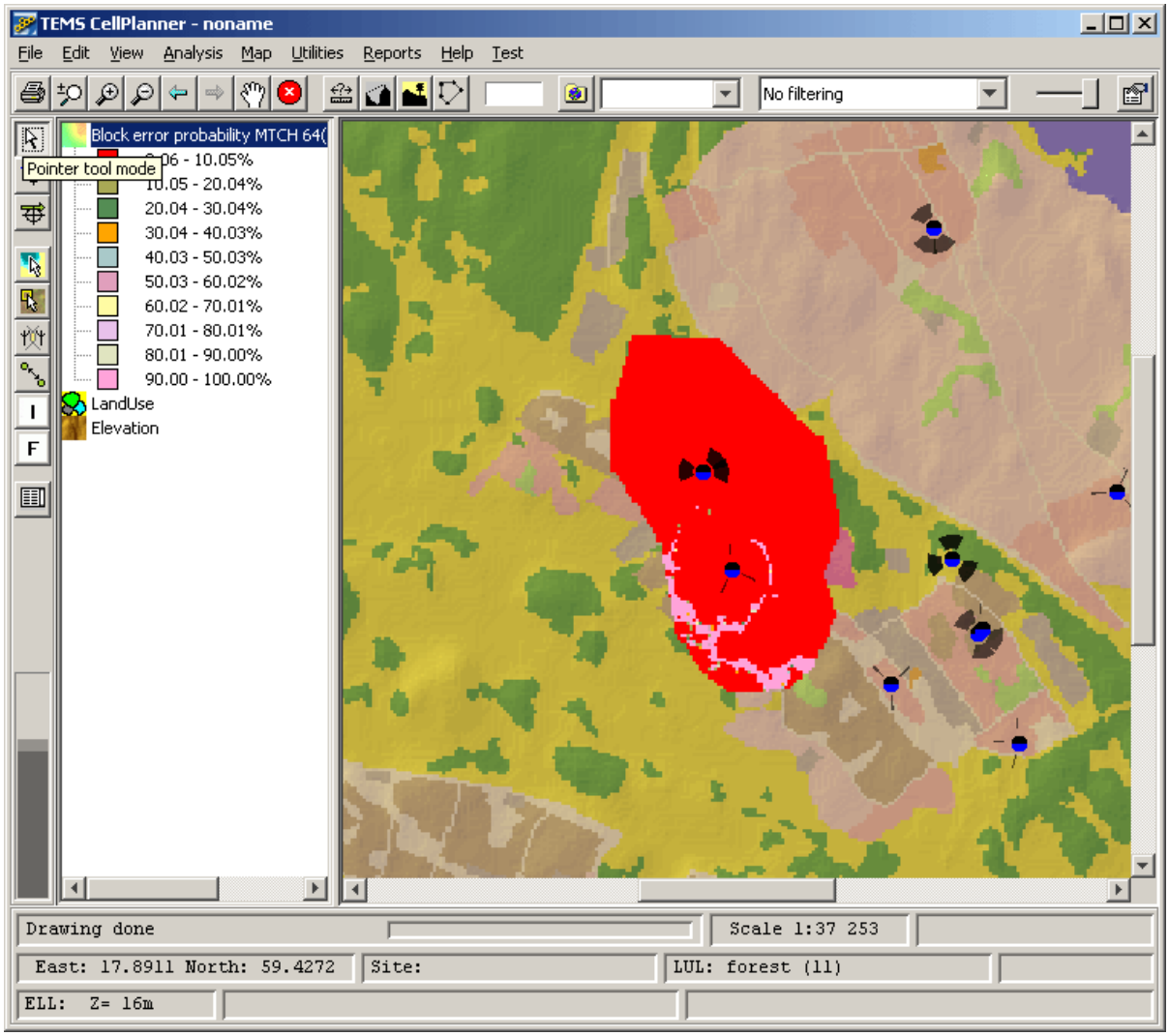


Block Error Probability MTCH 64

The Block Error Probability MTCH 64 plot The block error probability values are derived from the SIR values by means of a mapping curve. The result is presented color coded per bin.

Example Plot

The following example shows the Block Error Probability MTCH 64 plot:

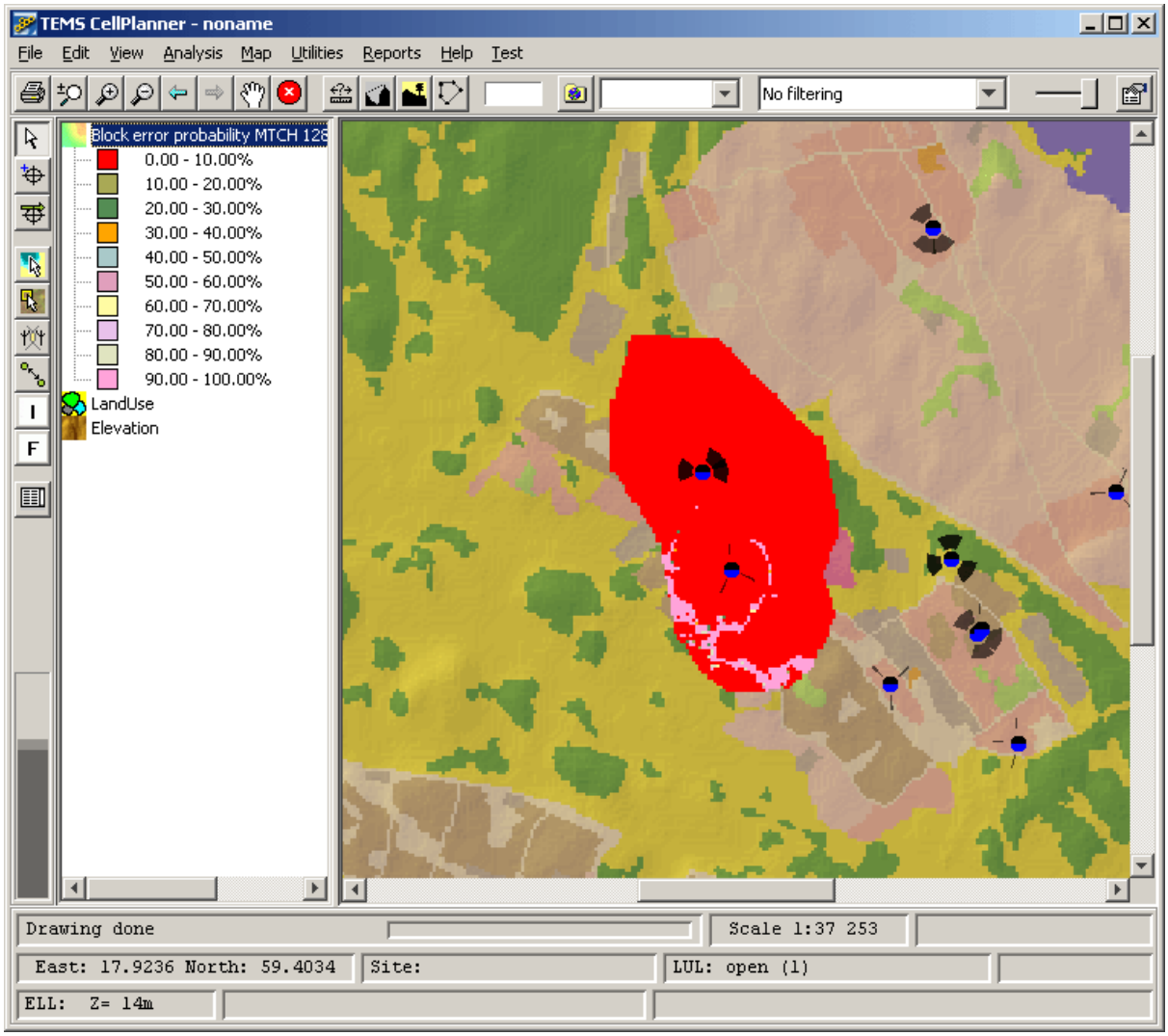


Block Error Probability MTCH 128

The Block Error Probability MTCH 128 plot The block error probability values are derived from the SIR values by means of a mapping curve. The result is presented color coded per bin.

Example Plot

The following example shows the Block Error Probability MTCH 128 plot:

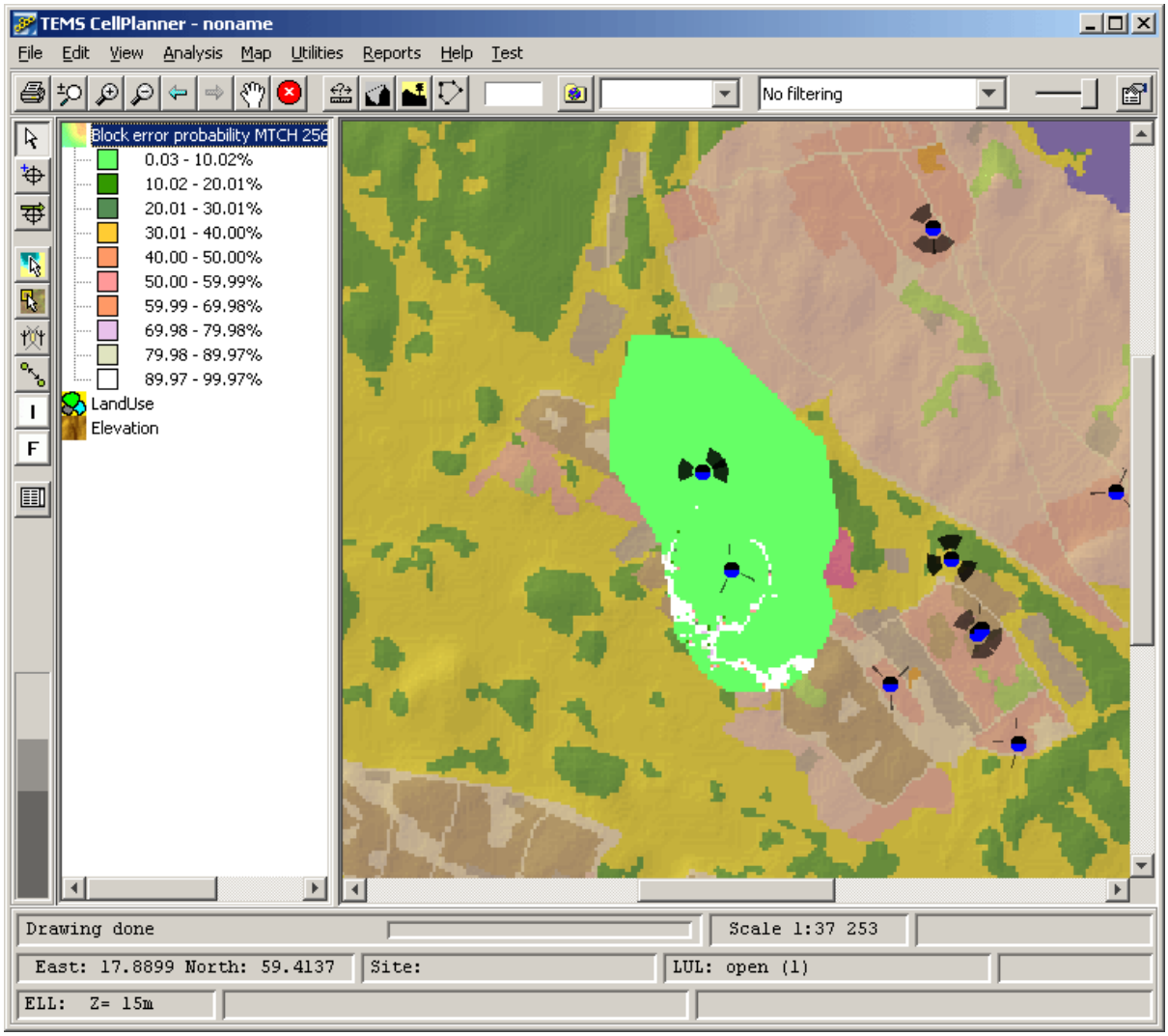


Block Error Probability MTCH 256

The Block Error Probability MTCH 256 plot The block error probability values are derived from the SIR values by means of a mapping curve. The result is presented color coded per bin.

Example Plot

The following example shows Block Error Probability MTCH 256 plot:



15 Working with WCDMA Reports

This chapter describes the reports available after WCDMA analysis has been performed.

Topics **Page**

About WCDMA Reports 15-2
WCDMA Coverage Report 15-3
WCDMA Pilot Coverage Report, Covered Area 15-5
WCDMA Pilot Coverage Report, Covered Individuals 15-9
WCDMA Statistics 15-12
Handover Statistics 15-16
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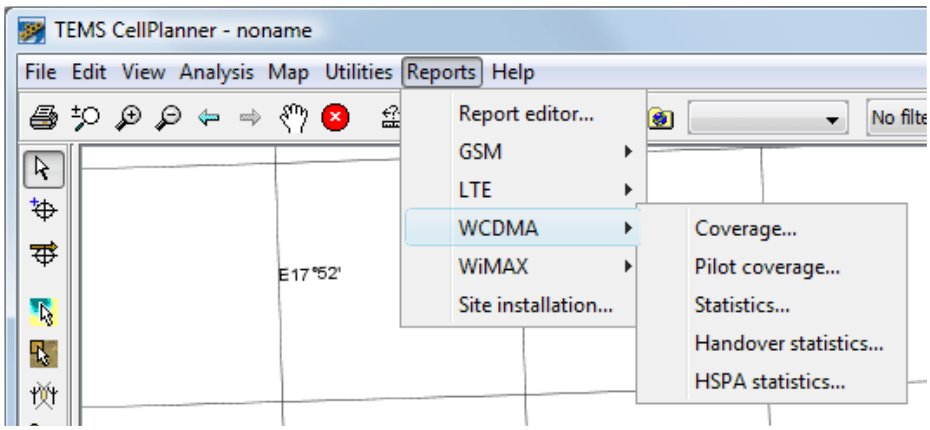
About WCDMA Reports

A *report* is a textual description in MS Excel format of the graphical information in an analysis area. Reports are valuable complements to plots, as they give a more complete overview of analysis results, and they can include more information than plots.

The following reports are relevant for a WCDMA network plan:

- WCDMA Coverage Report
- WCDMA Pilot Coverage Report, Covered Area
- WCDMA Pilot Coverage Report, Covered Individuals
- WCDMA Statistics
- Handover Statistics
- HSPA Statistics
- Customized Reports
- Site installation report, see the *TEMS CellPlanner Common Features User's Guide*

You generate WCDMA reports from the **Reports** menu:



Chapter *Working with Reports* in the *TEMS CellPlanner Common Features User's Guide* describes how to customize reports.

WCDMA Coverage Report

This report tells how many square kilometers are covered by a WCDMA carrier for certain margins of DL CPICH, DL TCH and UL TCH.

For a given area the following is reported per land use category:

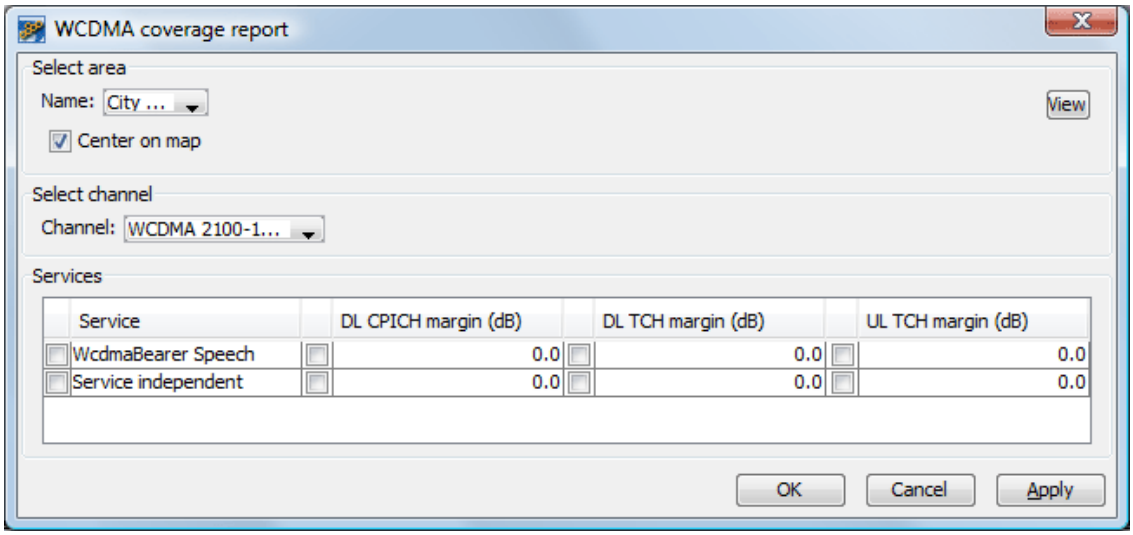
- total area (km^2) of that category
- size of area (km^2) of that category covered by a best server
- percentage of area (km^2) of that category covered by a best server

Prerequisites

- Include a landuse map layer in the Project settings, see *Add Map Layers to Projects* in the *TEMS CellPlanner Common Features User's Guide*.
- Composite pathloss calculation results are available for the area to report, see Calculate Composite Pathloss Matrix.
- Analysis results of **coverage** are available for the area, channel and bearer to report, see Set WCDMA Analysis Calculation Results Parameters.

Procedure

1. Select **Reports↗WCDMA↗Coverage. The WCDMA coverage report window appears.**



2. Select the **Channel** to report.
3. For each service to report, set **DL CPICH, DL TCH** and **UL TCH margins**.
4. Enter the other parameters and click **Generate.** One Excel file per service is created.

Fields on the Window

The table below describes the fields on the WCDMA coverage report window:

Field	Description
Name	List of areas selectable for the report.
Center on map	Centers the area in the map display for viewing.
View	Displays the statistics area in the map display.
Channel	List of channels (frequencies) to select for the report.
Services	List of services to select for the report. Only the services with separate CPICH plots are listed. Disabled if only service independent plots are available.
DL CPICH margin (dB)	Default = 0 dB.
DL TCH margin (dB)	Default = 0 dB.
UL TCH margin (dB)	Default = 0 dB.
Generate	Generates the report.

WCDMA Pilot Coverage Report, Covered Area

This report tells how many square kilometers are covered by a WCDMA pilot within certain RSCP and Ec/No intervals, see Example of WCDMA Pilot Coverage Report, Covered Area.

The bin size is defined by the resolution of the landuse map layer in your project.

Prerequisites

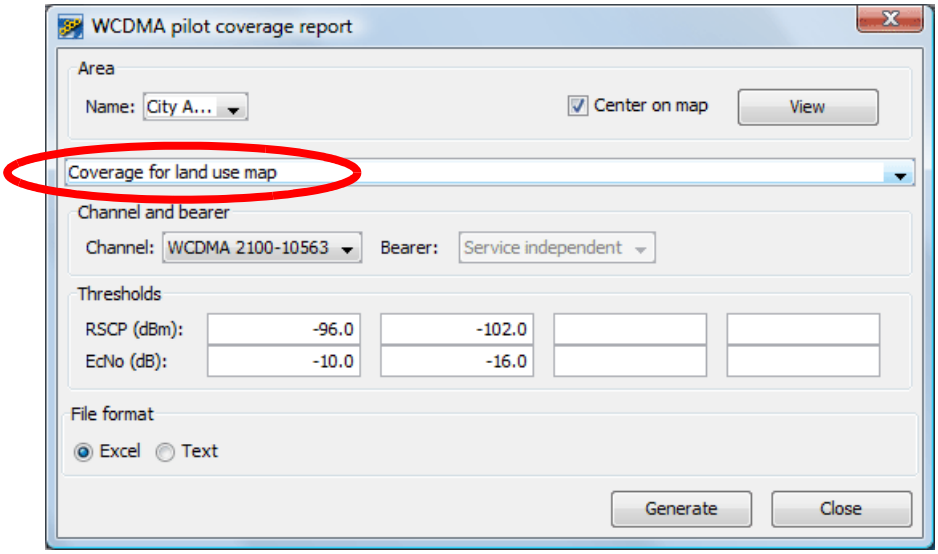
Before generating the WCDMA pilot coverage report you need the following:

- Include a **landuse** map layer in the Project settings, see *Add Map Layers to Projects* in the *TEMS CellPlanner Common Features User's Guide*.
- Composite pathloss calculation results are available for the area to report, see Calculate Composite Pathloss Matrix.
- Analysis results of **coverage** are available for the area, channel and bearer to report, see Set WCDMA Analysis Calculation Results Parameters.

Procedure

Follow these steps to generate the pilot coverage report:

1. Select **Reports↗WCDMA↗Pilot Coverage...**. The **WCDMA pilot coverage report** window is displayed.



2. Select **Coverage for land use map**.
3. Enter the other parameters, see Fields on Window "WCDMA pilot coverage report".

4. Click **Generate**. The report is generated, see Example of WCDMA Pilot Coverage Report, Covered Area.

Fields on Window "WCDMA pilot coverage report"

The table below describes the WCMDA pilot coverage report window fields:

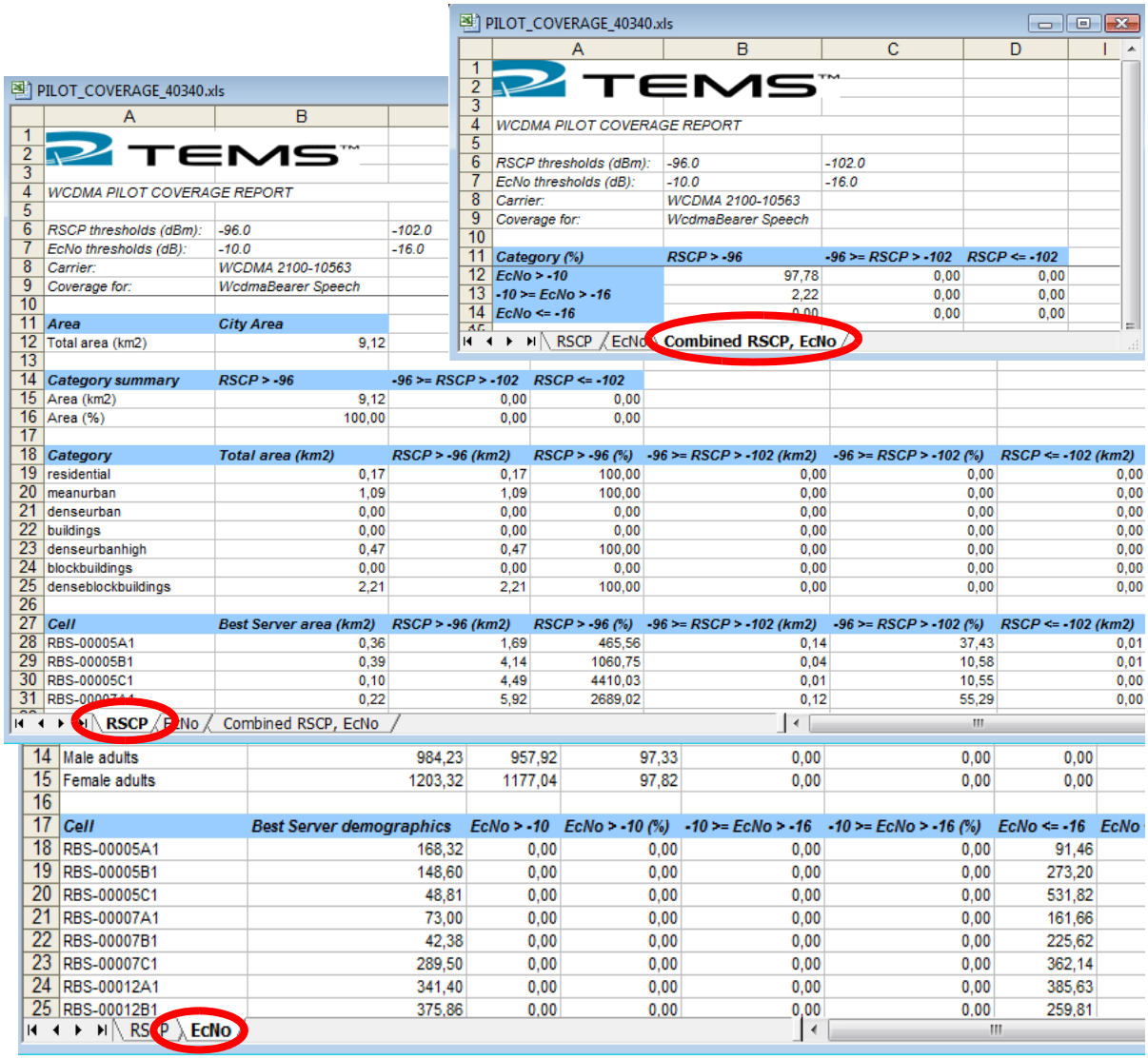
Field	Description
Area	The area to include in the report. Selected from a list of available areas.
Center on map	Centers the area in the map display for viewing.
View	Displays the statistics area in the map display.
(Report selection)	Selects the type of report to generate. Possible choices: • Coverage for land use map • Demographics for demographic map
Channel	The frequency band and carrier number to include in the report. Selected from a list of available channels.
Bearer	Bearer to include in the report. Selected from a list of bearers, available only if bearer specific CPICH plots are generated in the analysis.
RSCP (dBm)	Thresholds delimiting RSCP intervals for the report. Up to four thresholds, corresponding to three intervals, can be defined. Range: 0 to -200. Initial values: -96.0 and -102.0 dBm.
Ec/No (dB)	Thresholds delimiting Ec/No intervals for the report. Up to four thresholds, corresponding to three intervals, can be defined. Range: 0 to -100. Initial values: -10.0 and 16.0 dB.
File format	The format of the report, or rather the three reports. Possible values: • Excel - three sheets in one file, one report in each • Text - three text files, one report in each
Generate	Generates and displays the pilot coverage as three reports: • RSCP report • Ec/No report • Combined RSCP and Ec/No report

Example of WCDMA Pilot Coverage Report, Covered Area

The report consists either of three Excel sheets, or three text files organized as:

- RSCP, showing the coverage per land use category as well as per cell
- EcNo, showing the coverage per land use category as well as per cell
- Combined RSCP, EcNo, showing the coverage for each combination of RSCP and Ec/No intervals

The example below shows a WCDMA pilot coverage report in Excel, described in Contents of WCDMA Pilot Coverage Report, Covered Area.



PILOT_COVERAGE_40340.xls

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WCDMA PILOT COVERAGE REPORT

RSCP thresholds (dBm):	-96.0	-102.0
EcNo thresholds (dB):	-10.0	-16.0
Carrier:	WCDMA 2100-10563	
Coverage for:	WcdmaBearer Speech	

Area	City Area
Total area (km2)	9,12

Category summary	RSCP > -96	-96 >= RSCP > -102	RSCP <= -102
Area (km2)	9,12	0,00	0,00
Area (%)	100,00	0,00	0,00

Category	Total area (km2)	RSCP > -96 (km2)	RSCP > -96 (%)	-96 >= RSCP > -102 (km2)	-96 >= RSCP > -102 (%)	RSCP <= -102 (km2)
residential	0,17	0,17	100,00	0,00	0,00	0,00
meanurban	1,09	1,09	100,00	0,00	0,00	0,00
denseurban	0,00	0,00	0,00	0,00	0,00	0,00
buildings	0,00	0,00	0,00	0,00	0,00	0,00
denseurbanhigh	0,47	0,47	100,00	0,00	0,00	0,00
blockbuildings	0,00	0,00	0,00	0,00	0,00	0,00
denseblockbuildings	2,21	2,21	100,00	0,00	0,00	0,00

Cell	Best Server area (km2)	RSCP > -96 (km2)	RSCP > -96 (%)	-96 >= RSCP > -102 (km2)	-96 >= RSCP > -102 (%)	RSCP <= -102 (km2)
RBS-00005A1	0,36	1,69	465,56	0,14	37,43	0,01
RBS-00005B1	0,39	4,14	1060,75	0,04	10,58	0,01
RBS-00005C1	0,10	4,49	4410,03	0,01	10,55	0,00
RBS-00007A1	0,22	5,92	2689,02	0,12	55,29	0,00

RSCP | EcNo | Combined RSCP, EcNo

PILOT_COVERAGE_40340.xls

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WCDMA PILOT COVERAGE REPORT

RSCP thresholds (dBm):	-96.0	-102.0
EcNo thresholds (dB):	-10.0	-16.0
Carrier:	WCDMA 2100-10563	
Coverage for:	WcdmaBearer Speech	

Category (%)	RSCP > -96	-96 >= RSCP > -102	RSCP <= -102
EcNo > -10	97,78	0,00	0,00
-10 >= EcNo > -16	2,22	0,00	0,00
EcNo <= -16	0,00	0,00	0,00

RSCP | EcNo | Combined RSCP, EcNo

Male adults	984,23	957,92	97,33	0,00	0,00	0,00
Female adults	1203,32	1177,04	97,82	0,00	0,00	0,00

Cell	Best Server demographics	EcNo > -10	EcNo > -10 (%)	-10 >= EcNo > -16	-10 >= EcNo > -16 (%)	EcNo <= -16	EcNo
RBS-00005A1	168,32	0,00	0,00	0,00	0,00	91,46	
RBS-00005B1	148,60	0,00	0,00	0,00	0,00	273,20	
RBS-00005C1	48,81	0,00	0,00	0,00	0,00	531,82	
RBS-00007A1	73,00	0,00	0,00	0,00	0,00	161,66	
RBS-00007B1	42,38	0,00	0,00	0,00	0,00	225,62	
RBS-00007C1	289,50	0,00	0,00	0,00	0,00	362,14	
RBS-00012A1	341,40	0,00	0,00	0,00	0,00	385,63	
RBS-00012B1	375,86	0,00	0,00	0,00	0,00	259,81	

RSCP | EcNo

Contents of WCDMA Pilot Coverage Report, Covered Area

For a given area, carrier and service, the following is reported...

... per land use category:

- Total area (km^2) pertaining to the land use category
- In RSCP (or Ec/No) sheet: The coverage area per RSCP (or Ec/No) interval, that is, the area of the specified land use category for which the strongest cell's

RSCP (or Ec/No) is within the RSCP (or Ec/No) interval. The pilot coverage is presented in km^2 as well as in percent of the land use area.

... per cell:

- Total area in km^2 covered by the cell's best server
- In RSCP (or Ec/No) sheet: The coverage area per RSCP (or Ec/No) interval, that is, the area where the RSCP (or Ec/No) received from the cell is within the RSCP (or Ec/No) interval. The pilot coverage area for a cell will usually exceed the best server area, calculated over the same area. The pilot coverage is presented in km^2 as well as in percent of the cell's best server area.

... per combination of RSCP and Ec/No intervals:

- percentage (%) of area within the interval combination

WCDMA Pilot Coverage Report, Covered Individuals

This report tells how many individuals are covered by a WCDMA pilot of a signal quality within certain RSCP and Ec/No intervals. The calculations are based on demographic data specifying the population density of various demographic categories in certain areas. The bin size is defined by the resolution of the landuse map layer in your project.

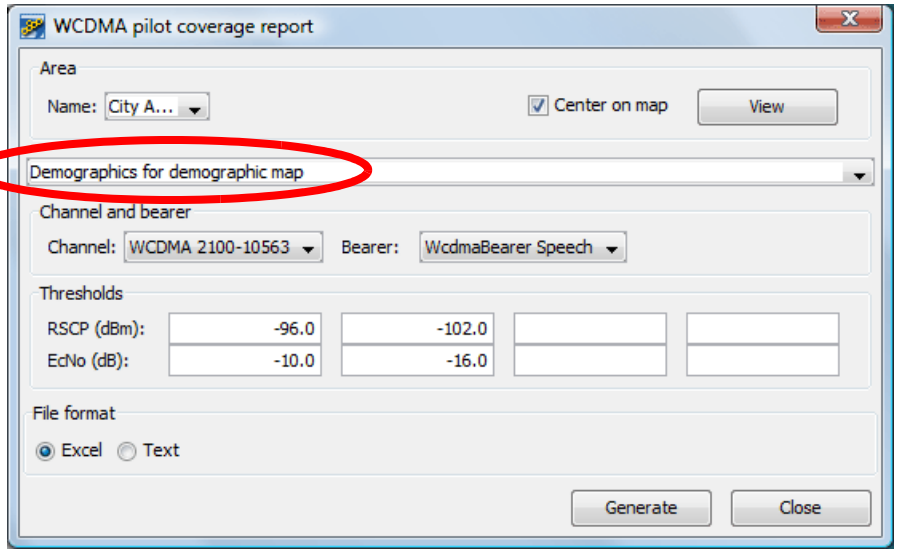
Prerequisites

Before generating the WCDMA pilot coverage report you need the following:

- Include a **demographics** map layer in the Project settings, see *Add Map Layers to Projects* in the *TEMS CellPlanner Common Features User's Guide*.
- Composite pathloss calculation results are available for the area to report, see Calculate Composite Pathloss Matrix.
- Analysis results of **coverage** are available for the area, channel and bearer to report, see Set WCDMA Analysis Calculation Results Parameters.

Procedure

Follow the same procedure as in WCDMA Pilot Coverage Report, Covered Area, but select **Demographics for demographic map**.



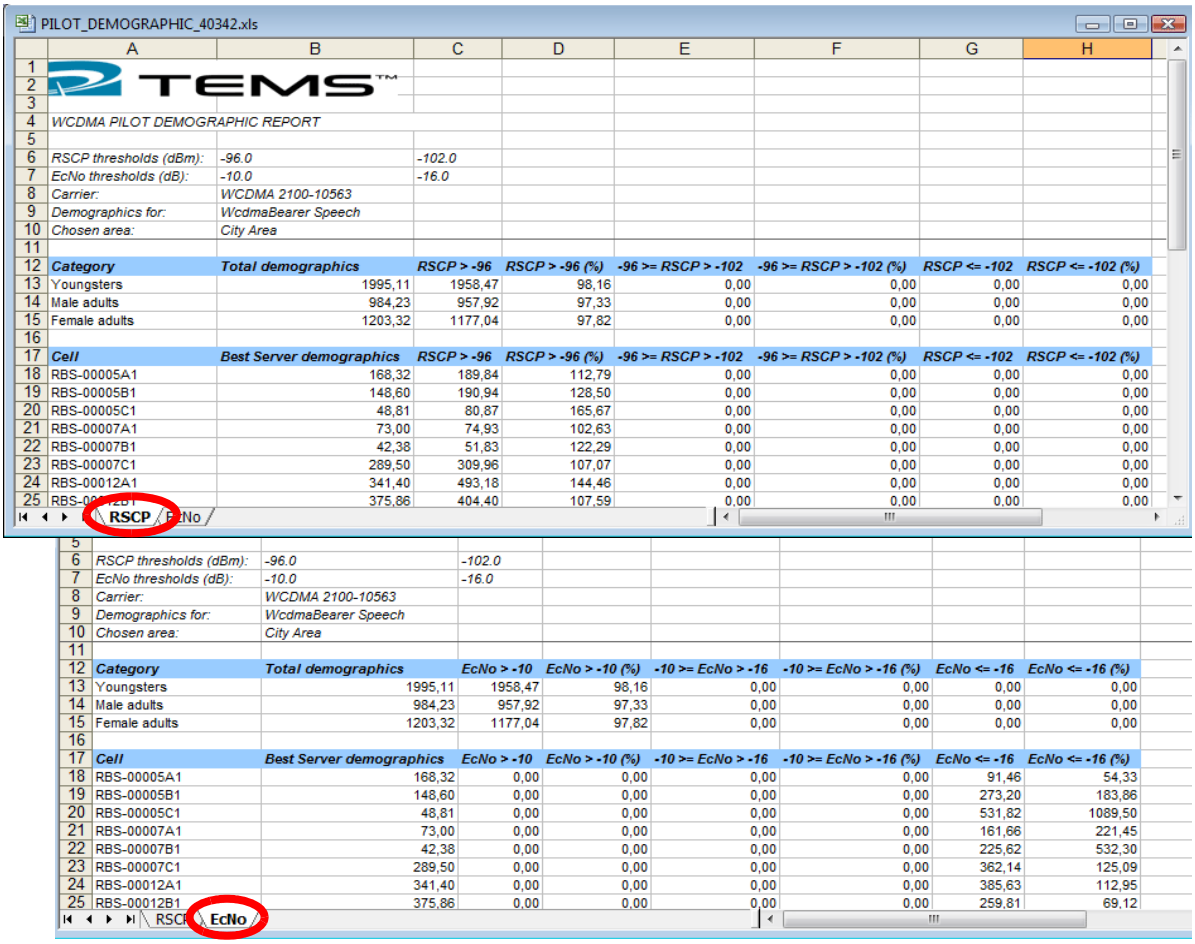
The result might look as in Example of WCDMA Pilot Coverage Report, Covered Individuals.

Example of WCDMA Pilot Coverage Report, Covered Individuals

The report consists either of two Excel sheets, or two text files organized as:

- **RSCP**, showing the coverage per demographic category as well as per cell
- **EcNo**, showing the coverage per demographic category as well as per cell

The following example shows the WCDMA pilot demographics report in Excel, with parameter descriptions in Contents of WCDMA Pilot Coverage Report, Covered Individuals.



PILOT_DEMOGRAPHIC_40342.xls

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WCDMA PILOT DEMOGRAPHIC REPORT

RSCP thresholds (dBm):	-96.0 / -102.0
EcNo thresholds (dB):	-10.0 / -16.0
Carrier:	WCDMA 2100-10563
Demographics for:	WcdmaBearer Speech
Chosen area:	City Area

Category	Total demographics	RSCP > -96	RSCP > -96 (%)	-96 >= RSCP > -102	-96 >= RSCP > -102 (%)	RSCP <= -102	RSCP <= -102 (%)
Youngsters	1995,11	1958,47	98,16	0,00	0,00	0,00	0,00
Male adults	984,23	957,92	97,33	0,00	0,00	0,00	0,00
Female adults	1203,32	1177,04	97,82	0,00	0,00	0,00	0,00

Cell	Best Server demographics	RSCP > -96	RSCP > -96 (%)	-96 >= RSCP > -102	-96 >= RSCP > -102 (%)	RSCP <= -102	RSCP <= -102 (%)
RBS-00005A1	168,32	189,84	112,79	0,00	0,00	0,00	0,00
RBS-00005B1	148,60	190,94	128,50	0,00	0,00	0,00	0,00
RBS-00005C1	48,81	80,87	165,67	0,00	0,00	0,00	0,00
RBS-00007A1	73,00	74,93	102,63	0,00	0,00	0,00	0,00
RBS-00007B1	42,38	51,83	122,29	0,00	0,00	0,00	0,00
RBS-00007C1	289,50	309,96	107,07	0,00	0,00	0,00	0,00
RBS-00012A1	341,40	493,18	144,46	0,00	0,00	0,00	0,00
RBS-00012B1	375,86	404,40	107,59	0,00	0,00	0,00	0,00

RSCP / EcNo

RSCP thresholds (dBm):	-96.0 / -102.0
EcNo thresholds (dB):	-10.0 / -16.0
Carrier:	WCDMA 2100-10563
Demographics for:	WcdmaBearer Speech
Chosen area:	City Area

Category	Total demographics	EcNo > -10	EcNo > -10 (%)	-10 >= EcNo > -16	-10 >= EcNo > -16 (%)	EcNo <= -16	EcNo <= -16 (%)
Youngsters	1995,11	1958,47	98,16	0,00	0,00	0,00	0,00
Male adults	984,23	957,92	97,33	0,00	0,00	0,00	0,00
Female adults	1203,32	1177,04	97,82	0,00	0,00	0,00	0,00

Cell	Best Server demographics	EcNo > -10	EcNo > -10 (%)	-10 >= EcNo > -16	-10 >= EcNo > -16 (%)	EcNo <= -16	EcNo <= -16 (%)
RBS-00005A1	168,32	0,00	0,00	0,00	0,00	91,46	54,33
RBS-00005B1	148,60	0,00	0,00	0,00	0,00	273,20	183,86
RBS-00005C1	48,81	0,00	0,00	0,00	0,00	531,82	1089,50
RBS-00007A1	73,00	0,00	0,00	0,00	0,00	161,66	221,45
RBS-00007B1	42,38	0,00	0,00	0,00	0,00	225,62	532,30
RBS-00007C1	289,50	0,00	0,00	0,00	0,00	362,14	125,09
RBS-00012A1	341,40	0,00	0,00	0,00	0,00	385,63	112,95
RBS-00012B1	375,86	0,00	0,00	0,00	0,00	259,81	69,12

RSCP / EcNo

Contents of WCDMA Pilot Coverage Report, Covered Individuals

For a given area, carrier and service, the following is reported...

... per demographic category:

- Total number of individuals pertaining to the category
- In RSCP (or Ec/No) sheet: Number of individuals covered per RSCP (or Ec/No) interval, that is, the area of the specified demographic category for which the strongest cell's RSCP (or Ec/No) is within the RSCP (or Ec/No) interval. The pilot coverage is presented in number of individuals as well as in percent of the total number of individuals of that category.

... per cell:

- Total number of individuals covered by the cell's best server
- In RSCP (or Ec/No) sheet: The number of individuals covered per RSCP (or Ec/No) interval, that is, the area where the RSCP (or Ec/No) received from the cell is within the RSCP (or Ec/No) interval. The number of individuals covered by the pilot in a cell will usually exceed the number of individuals covered by a best server, calculated over the same area. The pilot coverage is presented in number of individuals as well as in percent of the number of individuals covered by a best server in that cell.

WCDMA Statistics

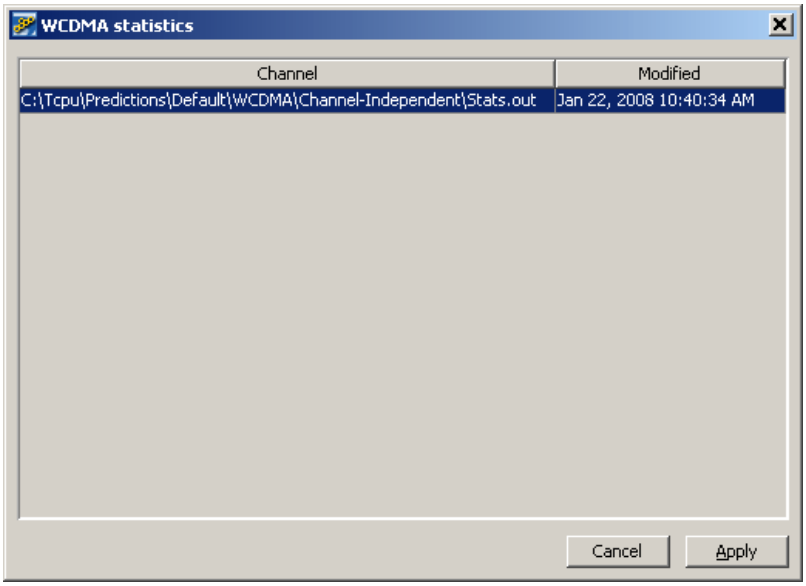
Use this procedure to generate WCDMA statistics per cell and site in a selected area. The report is generated in Excel format.

WCDMA statistics can only be generated when Monte Carlo analysis is performed. Statistics are collected on subscriber, cell and system level, including power, interference and outage on cell level, as well as outage statistics on cell and site level. For most of these parameters, average, minimum value, maximum value and standard deviation is calculated.

WCDMA statistics provide an overview of places in the network plan where additional planning and optimization steps are required.

Procedure

1. Select Reports↗WCDMA↗WCDMA statistics to display the **WCDMA statistics** window.



2. Click **Apply**. The statistics are generated and displayed in an Excel spreadsheet.
3. When you have finished viewing the report, click **Cancel** to close the window.

Fields on the Window

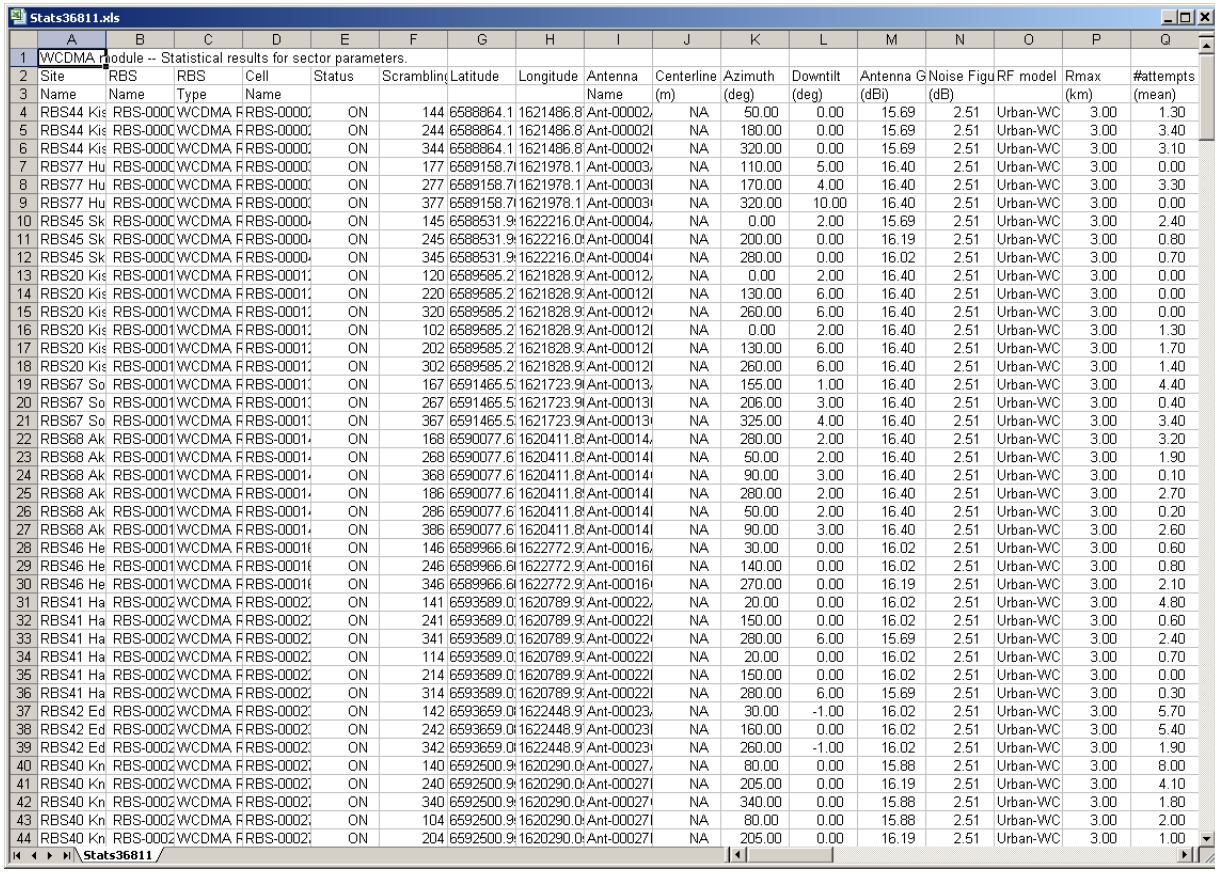
The following table describes the fields on the window:

Field	Description
Channel	Lists channels for which WCDMA analysis was performed

Field	Description
Modified	The date when the statistics file for the channels was updated
Apply	Generates the statistics and displays them in Excel.

Example WCDMA Statistics Report

The following example shows the **WCDMA statistics** report in Excel. See also Description of Fields in the WCDMA Statistics Report.



Stats36811.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	WCDMA module -- Statistical results for sector parameters.																
2	Site	RBS	RBS	Cell	Status	Scrambling	Latitude	Longitude	Antenna	Centerline	Azimuth	Downtilt	Antenna G	Noise Figu	RF model	Rmax	#attempts
3	Name	Name	Type	Name					Name	(m)	(deg)	(deg)	(dBi)	(dB)		(km)	(mean)
4	RBS44 Kis	RBS-0000	WCDMA R	RBS-0000	ON	144	6588864.1	1621486.8	Ant-00002	NA	50.00	0.00	15.69	2.51	Urban-WC	3.00	1.30
5	RBS44 Kis	RBS-0000	WCDMA R	RBS-0000	ON	244	6588864.1	1621486.8	Ant-00002	NA	180.00	0.00	15.69	2.51	Urban-WC	3.00	3.40
6	RBS44 Kis	RBS-0000	WCDMA R	RBS-0000	ON	344	6588864.1	1621486.8	Ant-00002	NA	320.00	0.00	15.69	2.51	Urban-WC	3.00	3.10
7	RBS77 Hu	RBS-0000	WCDMA R	RBS-0000	ON	177	6589158.7	1621978.1	Ant-00003	NA	110.00	5.00	16.40	2.51	Urban-WC	3.00	0.00
8	RBS77 Hu	RBS-0000	WCDMA R	RBS-0000	ON	277	6589158.7	1621978.1	Ant-00003	NA	170.00	4.00	16.40	2.51	Urban-WC	3.00	3.30
9	RBS77 Hu	RBS-0000	WCDMA R	RBS-0000	ON	377	6589158.7	1621978.1	Ant-00003	NA	320.00	10.00	16.40	2.51	Urban-WC	3.00	0.00
10	RBS45 Sk	RBS-0000	WCDMA R	RBS-0000	ON	145	6588531.9	1622216.0	Ant-00004	NA	0.00	2.00	15.69	2.51	Urban-WC	3.00	2.40
11	RBS45 Sk	RBS-0000	WCDMA R	RBS-0000	ON	245	6588531.9	1622216.0	Ant-00004	NA	200.00	0.00	16.19	2.51	Urban-WC	3.00	0.80
12	RBS45 Sk	RBS-0000	WCDMA R	RBS-0000	ON	345	6588531.9	1622216.0	Ant-00004	NA	280.00	0.00	16.02	2.51	Urban-WC	3.00	0.70
13	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	120	6589585.2	1621828.9	Ant-00012	NA	0.00	2.00	16.40	2.51	Urban-WC	3.00	0.00
14	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	220	6589585.2	1621828.9	Ant-00012	NA	130.00	6.00	16.40	2.51	Urban-WC	3.00	0.00
15	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	320	6589585.2	1621828.9	Ant-00012	NA	260.00	6.00	16.40	2.51	Urban-WC	3.00	0.00
16	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	102	6589585.2	1621828.9	Ant-00012	NA	0.00	2.00	16.40	2.51	Urban-WC	3.00	1.30
17	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	202	6589585.2	1621828.9	Ant-00012	NA	130.00	6.00	16.40	2.51	Urban-WC	3.00	1.70
18	RBS20 Kis	RBS-0001	WCDMA R	RBS-0001	ON	302	6589585.2	1621828.9	Ant-00012	NA	260.00	6.00	16.40	2.51	Urban-WC	3.00	1.40
19	RBS67 So	RBS-0001	WCDMA R	RBS-0001	ON	167	6591465.5	1621723.9	Ant-00013	NA	155.00	1.00	16.40	2.51	Urban-WC	3.00	4.40
20	RBS67 So	RBS-0001	WCDMA R	RBS-0001	ON	267	6591465.5	1621723.9	Ant-00013	NA	206.00	3.00	16.40	2.51	Urban-WC	3.00	0.40
21	RBS67 So	RBS-0001	WCDMA R	RBS-0001	ON	367	6591465.5	1621723.9	Ant-00013	NA	325.00	4.00	16.40	2.51	Urban-WC	3.00	3.40
22	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	168	6590077.6	1620411.8	Ant-00014	NA	280.00	2.00	16.40	2.51	Urban-WC	3.00	3.20
23	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	268	6590077.6	1620411.8	Ant-00014	NA	50.00	2.00	16.40	2.51	Urban-WC	3.00	1.90
24	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	368	6590077.6	1620411.8	Ant-00014	NA	90.00	3.00	16.40	2.51	Urban-WC	3.00	0.10
25	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	186	6590077.6	1620411.8	Ant-00014	NA	280.00	2.00	16.40	2.51	Urban-WC	3.00	2.70
26	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	286	6590077.6	1620411.8	Ant-00014	NA	50.00	2.00	16.40	2.51	Urban-WC	3.00	0.20
27	RBS68 Ak	RBS-0001	WCDMA R	RBS-0001	ON	386	6590077.6	1620411.8	Ant-00014	NA	90.00	3.00	16.40	2.51	Urban-WC	3.00	2.60
28	RBS46 He	RBS-0001	WCDMA R	RBS-0001	ON	146	6589966.6	1622772.9	Ant-00016	NA	30.00	0.00	16.02	2.51	Urban-WC	3.00	0.60
29	RBS46 He	RBS-0001	WCDMA R	RBS-0001	ON	246	6589966.6	1622772.9	Ant-00016	NA	140.00	0.00	16.02	2.51	Urban-WC	3.00	0.80
30	RBS46 He	RBS-0001	WCDMA R	RBS-0001	ON	346	6589966.6	1622772.9	Ant-00016	NA	270.00	0.00	16.19	2.51	Urban-WC	3.00	2.10
31	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	141	6593589.0	1620789.9	Ant-00022	NA	20.00	0.00	16.02	2.51	Urban-WC	3.00	4.80
32	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	241	6593589.0	1620789.9	Ant-00022	NA	150.00	0.00	16.02	2.51	Urban-WC	3.00	0.60
33	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	341	6593589.0	1620789.9	Ant-00022	NA	280.00	6.00	15.69	2.51	Urban-WC	3.00	2.40
34	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	114	6593589.0	1620789.9	Ant-00022	NA	20.00	0.00	16.02	2.51	Urban-WC	3.00	0.70
35	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	214	6593589.0	1620789.9	Ant-00022	NA	150.00	0.00	16.02	2.51	Urban-WC	3.00	0.00
36	RBS41 Ha	RBS-0002	WCDMA R	RBS-0002	ON	314	6593589.0	1620789.9	Ant-00022	NA	280.00	6.00	15.69	2.51	Urban-WC	3.00	0.30
37	RBS42 Ed	RBS-0002	WCDMA R	RBS-0002	ON	142	6593659.0	1622448.9	Ant-00023	NA	30.00	-1.00	16.02	2.51	Urban-WC	3.00	5.70
38	RBS42 Ed	RBS-0002	WCDMA R	RBS-0002	ON	242	6593659.0	1622448.9	Ant-00023	NA	160.00	0.00	16.02	2.51	Urban-WC	3.00	5.40
39	RBS42 Ed	RBS-0002	WCDMA R	RBS-0002	ON	342	6593659.0	1622448.9	Ant-00023	NA	260.00	-1.00	16.02	2.51	Urban-WC	3.00	1.90
40	RBS40 Kn	RBS-0002	WCDMA R	RBS-0002	ON	140	6592500.9	1620290.0	Ant-00027	NA	80.00	0.00	15.88	2.51	Urban-WC	3.00	8.00
41	RBS40 Kn	RBS-0002	WCDMA R	RBS-0002	ON	240	6592500.9	1620290.0	Ant-00027	NA	205.00	0.00	16.19	2.51	Urban-WC	3.00	4.10
42	RBS40 Kn	RBS-0002	WCDMA R	RBS-0002	ON	340	6592500.9	1620290.0	Ant-00027	NA	340.00	0.00	15.88	2.51	Urban-WC	3.00	1.80
43	RBS40 Kn	RBS-0002	WCDMA R	RBS-0002	ON	104	6592500.9	1620290.0	Ant-00027	NA	80.00	0.00	15.88	2.51	Urban-WC	3.00	2.00
44	RBS40 Kn	RBS-0002	WCDMA R	RBS-0002	ON	204	6592500.9	1620290.0	Ant-00027	NA	205.00	0.00	16.19	2.51	Urban-WC	3.00	1.00

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Description of Fields in the WCDMA Statistics Report

The statistics report is split into the following sections within the spreadsheet:

Fields on Report	Description
Site information	Site name, RBS name and type, cell name, status of the site (on or off), the scrambling code assigned to the cells, and the latitude and longitude of the site location.
Antenna information	For each site, and cell, includes antenna ID, centerline in meters, azimuth and downtilt in degrees, antenna gain in dBi, noise figure in dB, and the propagation model used with the antenna branch.
Information on connection attempts from users	For each WCDMA bearer, information is provided on the connection attempts (minimum, maximum, and standard deviation), and users served (mean, minimum, maximum, and standard deviation).
Connection quality information	Noise rise in dB (mean, minimum, maximum, standard deviation).
Frequency reuse information	Mean, minimum, maximum, standard deviation
DL power	DL power in dBm (mean, minimum, maximum, standard deviation)
UL loading	Percentage of UL loading (mean, minimum, maximum, standard deviation)
DL loading	Percentage of DL loading (mean, minimum, maximum, standard deviation)
UL channel elements	UL channel element values for cells and carriers (average values over all trials, maximum, minimum and standard deviation).
DL channel elements	DL channel element values for cells and carriers (average values over all trials, maximum, minimum and standard deviation).
Statistical results for site parameters	The results listed below can be obtained: • Connection attempts and percent served • Insufficient CPICH • Insufficient DL and UL power • DL overloaded • Blocked UL and DL ASE • Blocked codes • Blocked due to high interference • Blocked due to spreading factors 8, 16, and 32 • Inactive packet data users, DL and UL • Blocked for unspecified reasons • Users outside coverage area See Description of Statistical Results for Site Parameters for a thorough description of each value.

Description of Statistical Results for Site Parameters

The values in the table below correspond to the field **Statistical results for site parameters** in Description of Fields in the WCDMA Statistics Report:

Statistical results for site parameters	Description	
Connection attempts and percent served	TBD	
Insufficient CPICH	Number of subscribers (using the selected bearer) that could not connect to the selected WCDMA carrier due to...	... the minimum required CPICH quality. In this case, the Ec/Io coverage margin is < 0 dB.
Insufficient DL and UL power		For DL: ... the upper limit on the DL link power For UL: ... the upper limit on the mobile transmitter power
DL overloaded		... the upper limit on the total DL power of the cell
Blocked UL and DL ASE		For DL: ... the upper limit of the number of DL ASEs in the cell. When TEMS CellPlanner calculates the total number of DL ASEs for the cells, then for a connection that involves cells in soft and/or softer handover, TEMS CellPlanner assigns DL ASEs to all the cells. For UL: ... the upper limit of the number of UL ASEs in the cell. When TEMS CellPlanner calculates the total number of UL ASEs for the cells, then for a connection that involves cells in soft and/or softer handover, TEMS CellPlanner assigns UL ASEs to all the cells, but the number is divided by the number of cells in handover.
Blocked codes		... the upper limit on the total number of orthogonal codes of the cell
Blocked due to high interference		... the upper limit on the UL noise rise
Blocked due to spreading factors 8, 16, and 32		... the upper limit on the channel elements of the cell. A low number of spreading factors for a bearer means that a high number of hardware resources in terms of channel elements are consumed.
Inactive packet data users, DL and UL	These subscribers are not blocked but have bitrate = 0.	
Blocked for unspecified reasons	Number of subscribers that were not connected at the end of a random trial, but for which no blocking reason was registered. This can occur when the blocking is due to several different blocking reasons.	
Users outside coverage area	TBD	

Handover Statistics

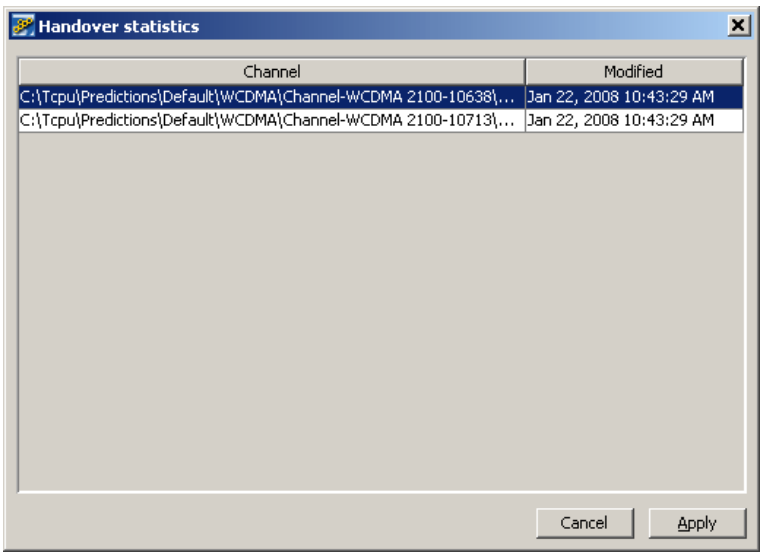
Use this procedure to generate handover statistics.

Prerequisites

You must run WCDMA analysis before you can generate statistics.

Procedure

1. Select Reports↗WCDMA↗Handover statistics to display the Handover statistics window.



2. Click **Apply**. The statistics are generated and displayed in an Excel spreadsheet.
3. When you have finished viewing the report, click **Cancel** to close the window.

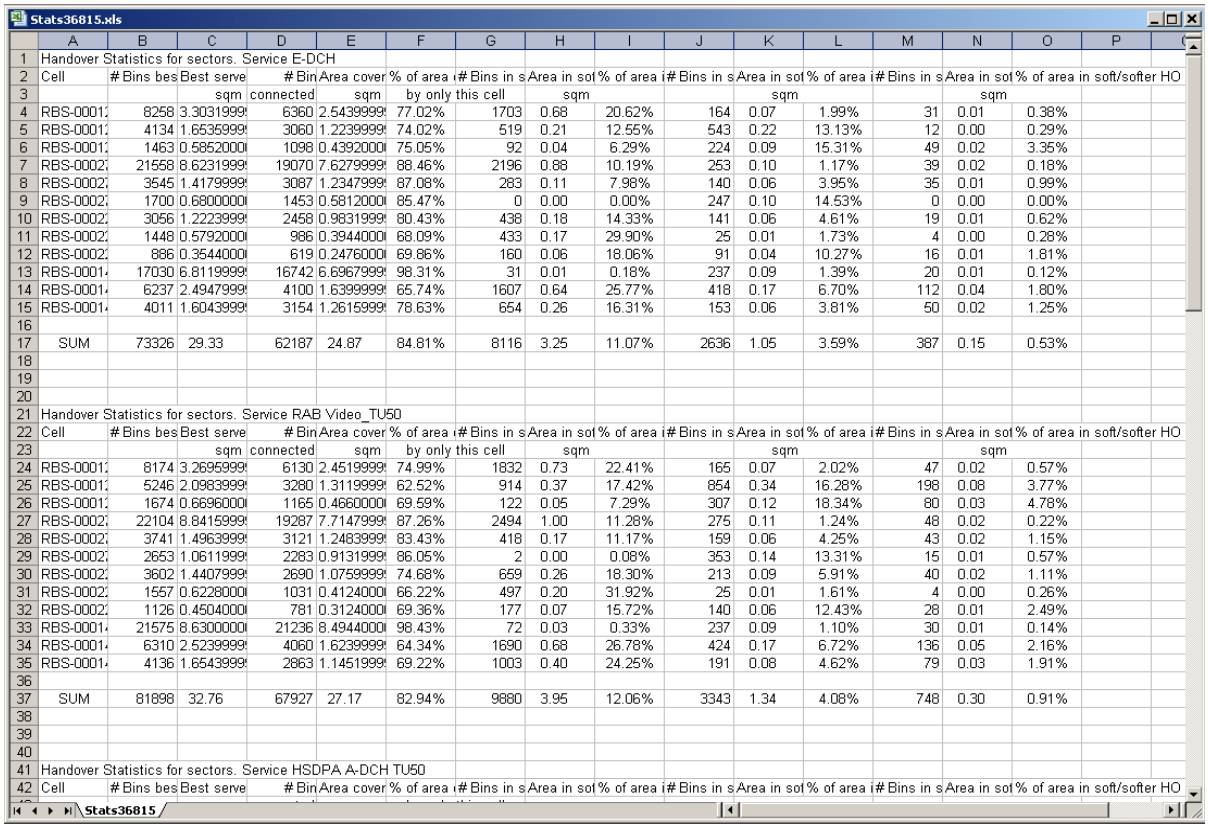
Fields on the Window

The following table describes the fields on the window:

Field	Description
Channel	Lists channels for which WCDMA analysis was performed
Modified	The date when the statistics file for the channels was updated
Apply	Generates the statistics and displays them in Excel.

Example Handover Statistics Report

The following example shows the **Handover statistics** report in Excel. See also Description of Fields in the Handover Statistics Report.



Stats36815.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Handover Statistics for sectors. Service E-DCH															
2	Cell	# Bins bes	Best serve	# Bin	Area cover	% of area	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area in soft/softer HO	
3			sqm	connected	sqm	by only this cell		sqm			sqm			sqm		
4	RBS-0001	8258	3.3031999	6360	2.5439999	77.02%	1703	0.68	20.62%	164	0.07	1.99%	31	0.01	0.38%	
5	RBS-0001	4134	1.6535999	3060	1.2239999	74.02%	519	0.21	12.55%	543	0.22	13.13%	12	0.00	0.29%	
6	RBS-0001	1463	0.5852000	1098	0.4392000	75.05%	92	0.04	6.29%	224	0.09	15.31%	49	0.02	3.35%	
7	RBS-0002	21558	8.6231999	19070	7.6279999	88.46%	2196	0.88	10.19%	253	0.10	1.17%	39	0.02	0.18%	
8	RBS-0002	3545	1.4179999	3087	1.2347999	87.08%	283	0.11	7.98%	140	0.06	3.95%	35	0.01	0.99%	
9	RBS-0002	1700	0.6800000	1453	0.5812000	85.47%	0	0.00	0.00%	247	0.10	14.53%	0	0.00	0.00%	
10	RBS-0002	3056	1.2223999	2458	0.9831999	80.43%	438	0.18	14.33%	141	0.06	4.61%	19	0.01	0.62%	
11	RBS-0002	1448	0.5792000	986	0.3944000	68.09%	433	0.17	29.90%	25	0.01	1.73%	4	0.00	0.28%	
12	RBS-0002	886	0.3544000	619	0.2476000	69.86%	160	0.06	18.06%	91	0.04	10.27%	16	0.01	1.81%	
13	RBS-0001	17030	6.8119999	16742	6.6967999	98.31%	31	0.01	0.18%	237	0.09	1.39%	20	0.01	0.12%	
14	RBS-0001	6237	2.4947999	4100	1.6399999	65.74%	1607	0.64	25.77%	418	0.17	6.70%	112	0.04	1.80%	
15	RBS-0001	4011	1.6043999	3154	1.2615999	78.63%	654	0.26	16.31%	153	0.06	3.81%	50	0.02	1.25%	
16																
17	SUM	73326	29.33	62187	24.87	84.81%	8116	3.25	11.07%	2636	1.05	3.59%	387	0.15	0.53%	
18																
19																
20																
21	Handover Statistics for sectors. Service RAB Video_TU50															
22	Cell	# Bins bes	Best serve	# Bin	Area cover	% of area	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area in soft/softer HO	
23			sqm	connected	sqm	by only this cell		sqm			sqm			sqm		
24	RBS-0001	8174	3.2695999	6130	2.4519999	74.99%	1832	0.73	22.41%	165	0.07	2.02%	47	0.02	0.57%	
25	RBS-0001	5246	2.0983999	3280	1.3119999	62.52%	914	0.37	17.42%	854	0.34	16.28%	198	0.08	3.77%	
26	RBS-0001	1674	0.6696000	1165	0.4660000	69.59%	122	0.05	7.29%	307	0.12	18.34%	80	0.03	4.78%	
27	RBS-0002	22104	8.8415999	19287	7.7147999	87.26%	2494	1.00	11.28%	275	0.11	1.24%	48	0.02	0.22%	
28	RBS-0002	3741	1.4963999	3121	1.2483999	83.43%	418	0.17	11.17%	159	0.06	4.25%	43	0.02	1.15%	
29	RBS-0002	2653	1.0611999	2283	0.9131999	86.05%	2	0.00	0.08%	353	0.14	13.31%	15	0.01	0.57%	
30	RBS-0002	3602	1.4407999	2690	1.0759999	74.68%	659	0.26	18.30%	213	0.09	5.91%	40	0.02	1.11%	
31	RBS-0002	1557	0.6228000	1031	0.4124000	66.22%	497	0.20	31.92%	25	0.01	1.61%	4	0.00	0.26%	
32	RBS-0002	1126	0.4504000	781	0.3124000	69.36%	177	0.07	15.72%	140	0.06	12.43%	28	0.01	2.49%	
33	RBS-0001	21575	8.6300000	21236	8.4944000	98.43%	72	0.03	0.33%	237	0.09	1.10%	30	0.01	0.14%	
34	RBS-0001	6310	2.5239999	4060	1.6239999	64.34%	1690	0.68	26.78%	424	0.17	6.72%	136	0.05	2.16%	
35	RBS-0001	4136	1.6543999	2863	1.1451999	69.22%	1003	0.40	24.25%	191	0.08	4.62%	79	0.03	1.91%	
36																
37	SUM	81898	32.76	67927	27.17	82.94%	9880	3.95	12.06%	3343	1.34	4.08%	748	0.30	0.91%	
38																
39																
40																
41	Handover Statistics for sectors. Service HSDPA A-DCH TU50															
42	Cell	# Bins bes	Best serve	# Bin	Area cover	% of area	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area i	# Bins in s	Area in sof	% of area in soft/softer HO	

Stats36815

Description of Fields in the Handover Statistics Report

The statistics report is split into the following sections within the spreadsheet:

Fields on Report	Description
Service independent handover statistics	Provides handover statistics for service independent conditions
Handover statistics per service	For each cell in the sector, includes: • Number of bins providing best server coverage • Best server coverage area in square meters • Number of bins connected to only one cell • Percent of area covered by a specific cell • Number of bins in soft handover • Area in soft handover in square meters • Percent of area in soft handover • Number of bins in softer handover • Area in softer handover in square meters • Percent of area in softer handover • Number of bins in soft/softer handover • Area in soft/softer handover • Percent of area in soft/softer handover
Sum	Provides statistics totals for each category of handover.

HSPA Statistics

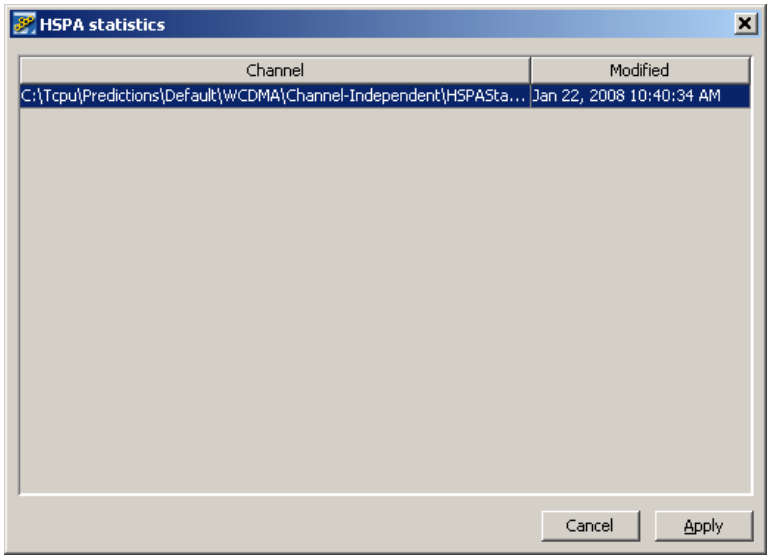
Use this procedure to generate HSDPA and EUL statistics as a Microsoft Excel spreadsheet.

Prerequisites

- You must run WCDMA analysis before you can generate statistics, with HSPA enabled.
- HSPA must be enabled in the cells included in WCDMA analysis.

Procedure

1. Select Reports↗WCDMA↗HSPA statistics to display the HSPA statistics window.



2. Click **Apply**. The statistics are generated and displayed in an Excel spreadsheet.
3. When you have finished viewing the report, click **Cancel** to close the window.

Fields on the Window

The following table describes the fields on the window:

Field	Description
Channel	Lists channels for which WCDMA analysis was performed
Modified	The date when the statistics file for the channels was updated
Apply	Generates the statistics and displays them in Excel.

Example HSPA Statistics Report

The following example shows the **HSPA statistics** report in Excel. See also Description of HSPA Statistics.

Stats7171.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	WCDMA-HSDPA module -- Statistical results for sector parameters.															
2	Site	RBS	RBS	Cell	Status	Scrambling	Latitude	Longitude	Antenna	Centerline	Azimuth	Downtilt	Antenna G	Noise Figu	RF model	Rmax
3	Name	Name	Type	Name					Name	(m)	(deg)	(deg)	(dBi)	(dB)		(km)
4	RBS44 Kis	RBS-0000	WCDMA F	RBS-00002	ON	144	6588864.1	1621486.8	Ant-00002	NA	50.00	0.00	15.69	2.51	Urban-WC	3.00
5	RBS44 Kis	RBS-0000	WCDMA F	RBS-00002	ON	244	6588864.1	1621486.8	Ant-00002	NA	180.00	0.00	15.69	2.51	Urban-WC	3.00
6	RBS44 Kis	RBS-0000	WCDMA F	RBS-00002	ON	344	6588864.1	1621486.8	Ant-00002	NA	320.00	0.00	15.69	2.51	Urban-WC	3.00
7	RBS77 Hu	RBS-0000	WCDMA F	RBS-00003	ON	177	6589158.7	1621978.1	Ant-00003	NA	110.00	5.00	16.40	2.51	Urban-WC	3.00
8	RBS77 Hu	RBS-0000	WCDMA F	RBS-00003	ON	277	6589158.7	1621978.1	Ant-00003	NA	170.00	4.00	16.40	2.51	Urban-WC	3.00
9	RBS77 Hu	RBS-0000	WCDMA F	RBS-00003	ON	377	6589158.7	1621978.1	Ant-00003	NA	320.00	10.00	16.40	2.51	Urban-WC	3.00
10	RBS45 Sk	RBS-0000	WCDMA F	RBS-00004	ON	145	6588531.9	1622216.0	Ant-00004	NA	0.00	2.00	15.69	2.51	Urban-WC	3.00
11	RBS45 Sk	RBS-0000	WCDMA F	RBS-00004	ON	245	6588531.9	1622216.0	Ant-00004	NA	200.00	0.00	16.19	2.51	Urban-WC	3.00
12	RBS45 Sk	RBS-0000	WCDMA F	RBS-00004	ON	345	6588531.9	1622216.0	Ant-00004	NA	280.00	0.00	16.02	2.51	Urban-WC	3.00
13	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	120	6589585.2	1621828.9	Ant-00012	NA	0.00	2.00	16.40	2.51	Urban-WC	3.00
14	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	220	6589585.2	1621828.9	Ant-00012	NA	130.00	6.00	16.40	2.51	Urban-WC	3.00
15	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	320	6589585.2	1621828.9	Ant-00012	NA	260.00	6.00	16.40	2.51	Urban-WC	3.00
16	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	102	6589585.2	1621828.9	Ant-00012	NA	0.00	2.00	16.40	2.51	Urban-WC	3.00
17	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	202	6589585.2	1621828.9	Ant-00012	NA	130.00	6.00	16.40	2.51	Urban-WC	3.00
18	RBS20 Kis	RBS-0001	WCDMA F	RBS-00012	ON	302	6589585.2	1621828.9	Ant-00012	NA	260.00	6.00	16.40	2.51	Urban-WC	3.00
19	RBS67 So	RBS-0001	WCDMA F	RBS-00013	ON	167	6591465.5	1621723.9	Ant-00013	NA	155.00	1.00	16.40	2.51	Urban-WC	3.00
20	RBS67 So	RBS-0001	WCDMA F	RBS-00013	ON	267	6591465.5	1621723.9	Ant-00013	NA	206.00	3.00	16.40	2.51	Urban-WC	3.00
21	RBS67 So	RBS-0001	WCDMA F	RBS-00013	ON	367	6591465.5	1621723.9	Ant-00013	NA	325.00	4.00	16.40	2.51	Urban-WC	3.00
22	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	168	6590077.6	1620411.9	Ant-00014	NA	280.00	2.00	16.40	2.51	Urban-WC	3.00
23	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	268	6590077.6	1620411.9	Ant-00014	NA	50.00	2.00	16.40	2.51	Urban-WC	3.00
24	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	368	6590077.6	1620411.9	Ant-00014	NA	90.00	3.00	16.40	2.51	Urban-WC	3.00
25	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	186	6590077.6	1620411.9	Ant-00014	NA	280.00	2.00	16.40	2.51	Urban-WC	3.00
26	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	286	6590077.6	1620411.9	Ant-00014	NA	50.00	2.00	16.40	2.51	Urban-WC	3.00
27	RBS68 Ak	RBS-0001	WCDMA F	RBS-00014	ON	386	6590077.6	1620411.9	Ant-00014	NA	90.00	3.00	16.40	2.51	Urban-WC	3.00
28	RBS46 He	RBS-0001	WCDMA F	RBS-00016	ON	146	6589966.6	1622772.9	Ant-00016	NA	30.00	0.00	16.02	2.51	Urban-WC	3.00
29	RBS46 He	RBS-0001	WCDMA F	RBS-00016	ON	246	6589966.6	1622772.9	Ant-00016	NA	140.00	0.00	16.02	2.51	Urban-WC	3.00
30	RBS46 He	RBS-0001	WCDMA F	RBS-00016	ON	346	6589966.6	1622772.9	Ant-00016	NA	270.00	0.00	16.19	2.51	Urban-WC	3.00
31	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	141	6593589.0	1620789.9	Ant-00022	NA	20.00	0.00	16.02	2.51	Urban-WC	3.00
32	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	241	6593589.0	1620789.9	Ant-00022	NA	150.00	0.00	16.02	2.51	Urban-WC	3.00
33	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	341	6593589.0	1620789.9	Ant-00022	NA	280.00	6.00	15.69	2.51	Urban-WC	3.00
34	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	114	6593589.0	1620789.9	Ant-00022	NA	20.00	0.00	16.02	2.51	Urban-WC	3.00
35	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	214	6593589.0	1620789.9	Ant-00022	NA	150.00	0.00	16.02	2.51	Urban-WC	3.00
36	RBS41 Ha	RBS-0002	WCDMA F	RBS-00022	ON	314	6593589.0	1620789.9	Ant-00022	NA	280.00	6.00	15.69	2.51	Urban-WC	3.00
37	RBS42 Ed	RBS-0002	WCDMA F	RBS-00023	ON	142	6593659.0	1622448.9	Ant-00023	NA	30.00	-1.00	16.02	2.51	Urban-WC	3.00

Stats7171

Description of HSPA Statistics

The HSDPA statistics report contains minimum, maximum, average, and standard deviation for the following parameters:

- HS-DSCH power per cell
- Number of assigned codes for HSDPA per cell, reported if Dynamic code allocation is enabled
- HS-DSCH peak bit rate per cell
- Total amount of HSDPA users served per cell
- Achieved HSDPA peak bit rate per A-DCH and terminal category per cell
- HSDPA users served per A-DCH and terminal category per cell
- HSDPA users blocked per A-DCH and terminal category due to load limit Max. no. of HSDPA users per cell
- HSDPA users blocked per A-DCH and terminal category due to load limit Max. no. of SF=4 users on uplink per cell

- HSDPA activity

EUL/HSUPA parameters in the statistics report include the mean, minimum, maximum and standard deviation:

- E-DCH data rate (kbps) (average over all trials)
- Number of EUL users (average over all trials)
- E-DCH data rate (kbps) for every E-DCH service and cell
- Number of EUL users or every E-DCH service and cell
- Number of blocked terminals due to Max number of EUL users or every E-DCH service and cell

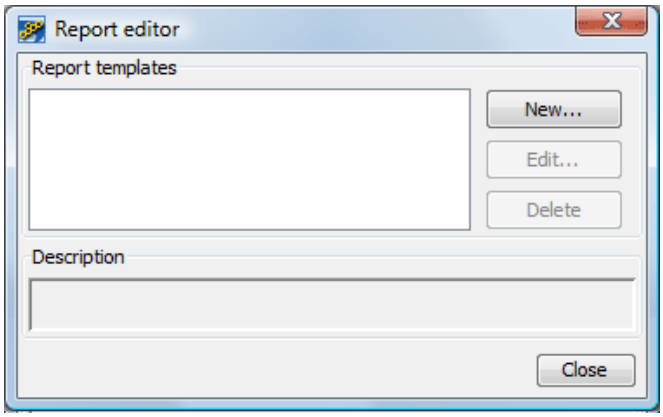
Customized Reports

You can create customized reports based on WCDMA sites, cells, RBSs, and RNCs.

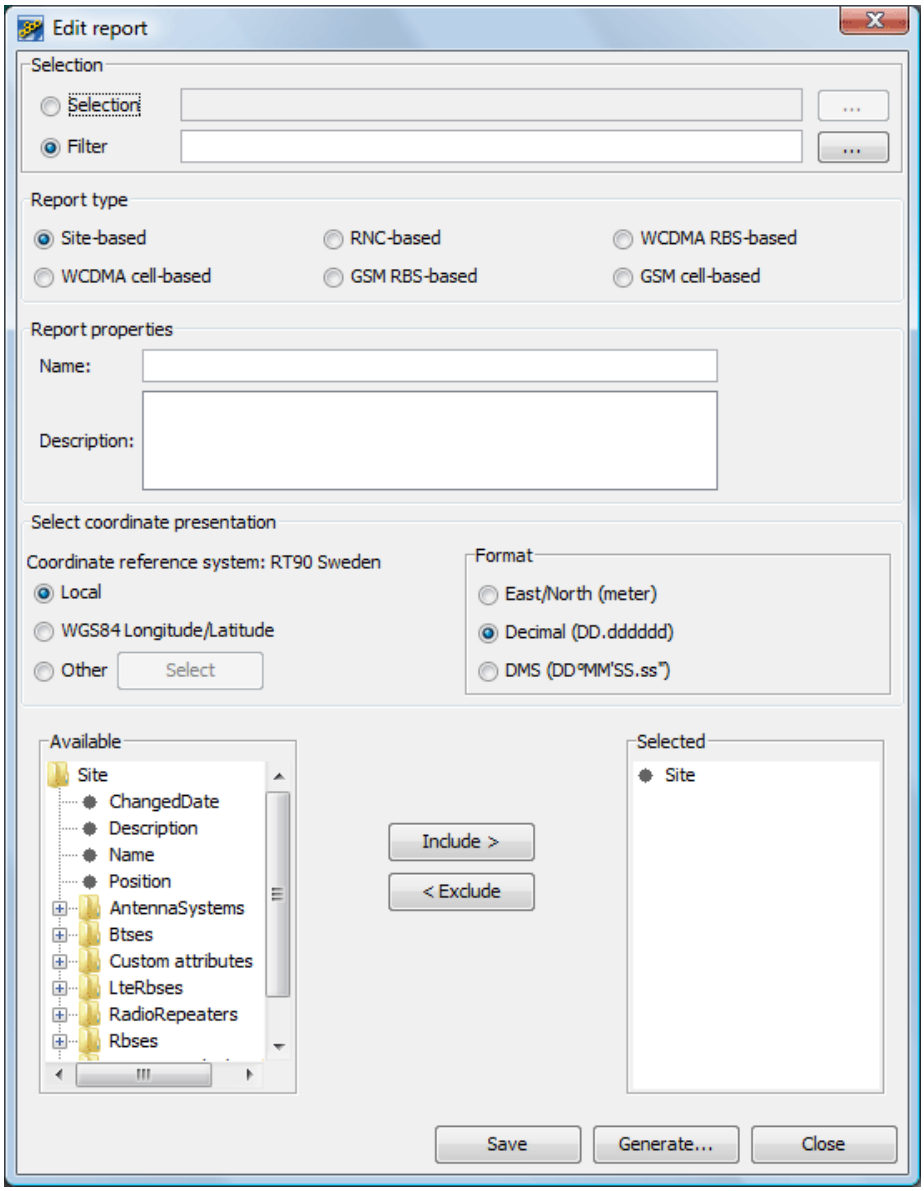
Procedure

Follow these steps to create customize reports:

1. Select **Reports↗Report editor**. The **Report editor** window appears.



2. Click **New**. The **Edit report** window appears.



3. Select the type of report, enter the report name and description, and select the objects to include in the report.
4. Click **Generate**. The report data is generated and the report is displayed on the screen as an MS Excel spreadsheet.
5. Click **Save** to save the report, and click **Close** to close the window.

Fields on the Window

The table below describes the fields on the window:

Field	Description
Selection	Selection of data used for the report
Map filter	Any filter(s) applied to the data for the report.
Report type	Type of report. Options are: • Site-based • RNC-based • RBS-based • WCell-based • GSM RBS • GCell-based
Name	Name of the report. Required for saving the report.
Description	Description of the report
Available	Data available for reporting
Include	Moves selections from the Available list to the Selected list
Exclude	Moves selections from the Selected list to the Available list
Selected	Lists items selected for the report
Save	Saves the report with the name you entered.
Generate	Generates the report based on the criteria you selected

16
Working with WCDMA Charts

This chapter describes the charts generated by WCDMA analysis functions.

Topics **Page**

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Antenna Height AMSL Chart 16-4
UL Connection Rate Chart 16-5
DL Connection Rate Chart 16-6
Connection Status Bar Chart 16-7
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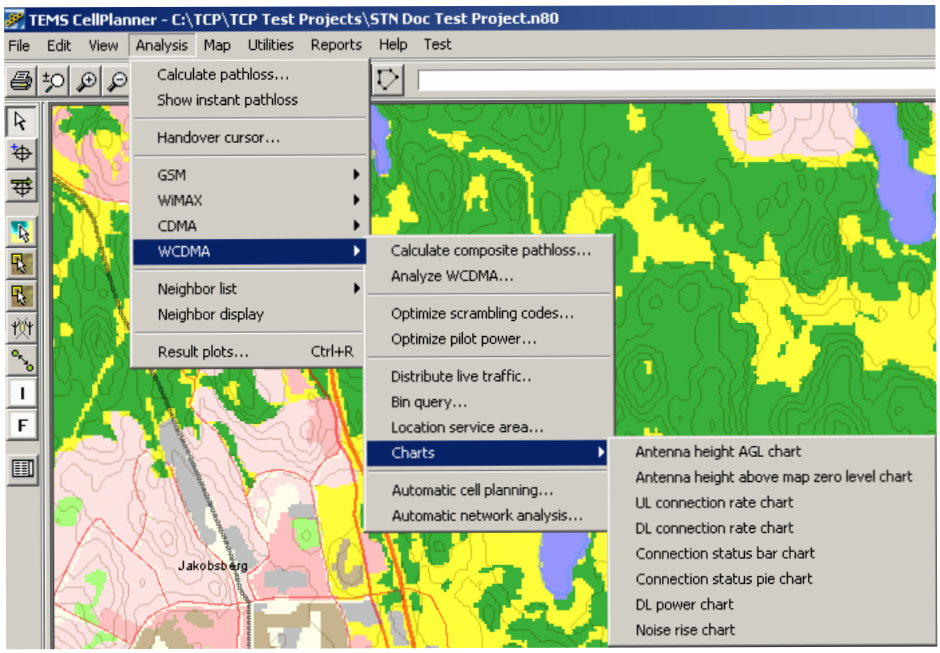
Noise Rise Chart 16-10

About WCDMA Charts

You can view WCDMA statistical information in charts. This gives a quick visual overview of the cell and site parameters as well as on the connection status of different WCDMA bearers for which WCDMA analysis has been run.

Menu Selection

The following example shows the WCDMA analysis charts menu:



Procedure

Follow these steps to display a statistics chart from WCDMA analysis:

1. Select **Analysis↗WCDMA↗Charts** to display any of the available charts.
2. Move the cursor to the desired chart and click on the name. A window is displayed with frequency channels used in WCDMA analysis.
3. Select the frequency channel for which you would like to display the chart. Set the threshold values and the resolution in terms of number of (display) bins and click **OK**.
4. The chart opens in a separate window, displaying the corresponding information.

Antenna Height AGL Chart

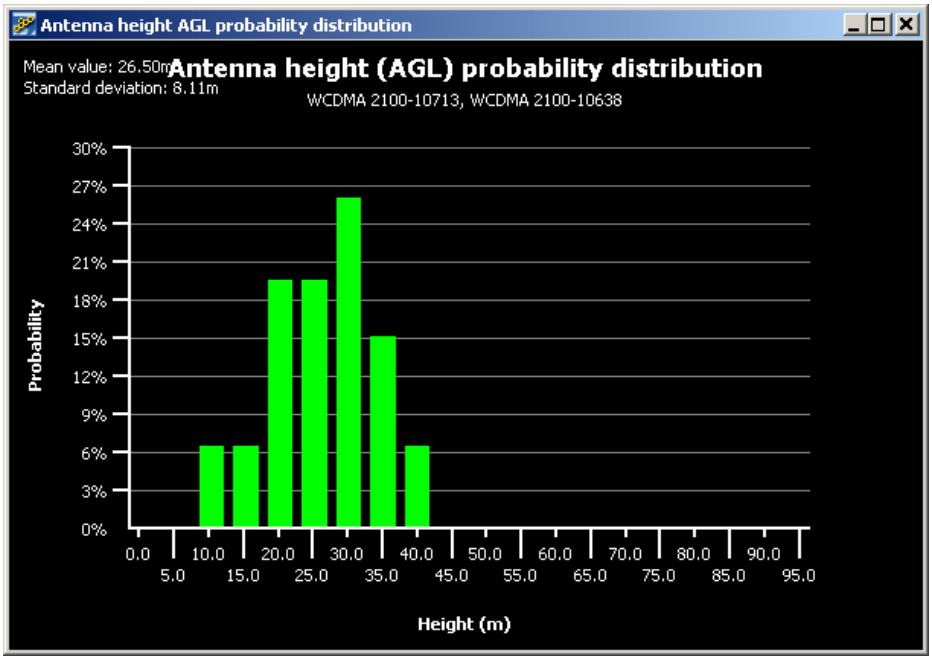
The Antenna Height AGL Chart displays the probability distribution of the antenna height above ground level for all cells in the selected frequency channel.

The chart allows you to quickly evaluate if there are any sites with antennas that are too low or too high in the network plan.

The chart also provides information on the mean value and the standard deviation.

Example Chart

The following example shows the Antenna Height AGL Chart:



Antenna Height AMSL Chart

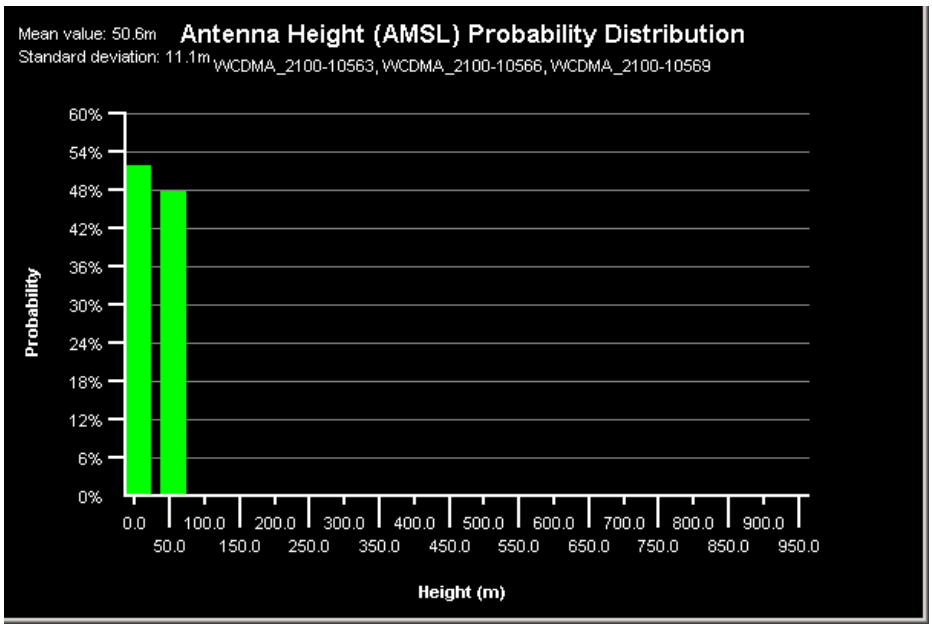
The Antenna Height AMSL Chart displays the probability distribution of the antenna height above mean sea level for all cells in the selected frequency channel.

The chart allows you to quickly evaluate if there are any sites with antennas that are too low or too high.

The chart also provides information on the mean value and the standard deviation.

Example Chart

The following example shows the Antenna Height AMSL Chart:

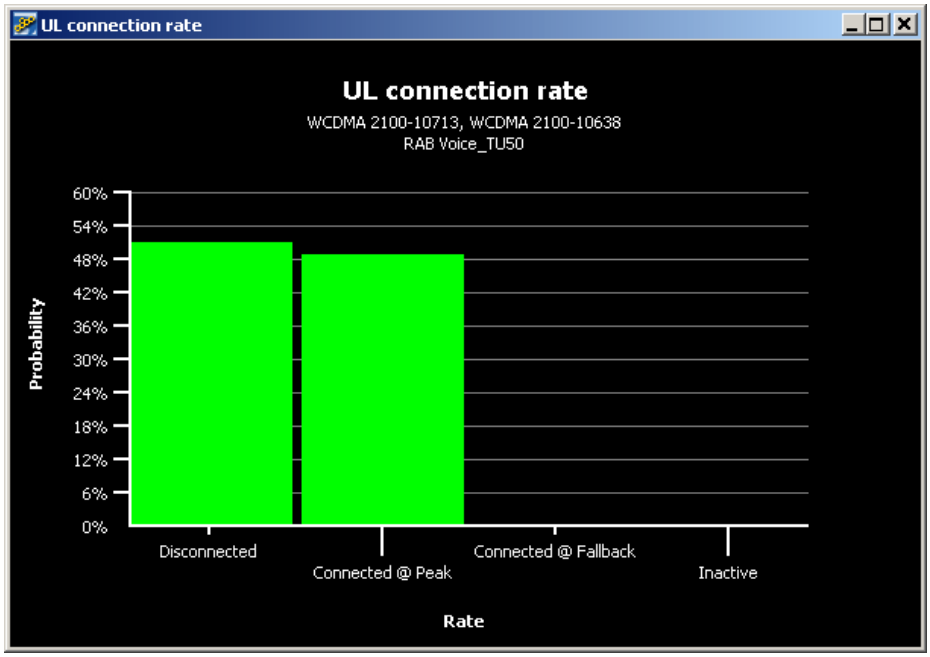


UL Connection Rate Chart

The UL Connection Rate Chart provides you with a quick overview on the user connection status for the selected WCDMA bearer. It shows the percent disconnected of all the users attempting to connect to the network, connected at the specified peak data rate or on a fallback rate if you specified such a fallback rate for that particular WCDMA bearer.

Example Chart

The following example shows the UL Connection Rate Chart:

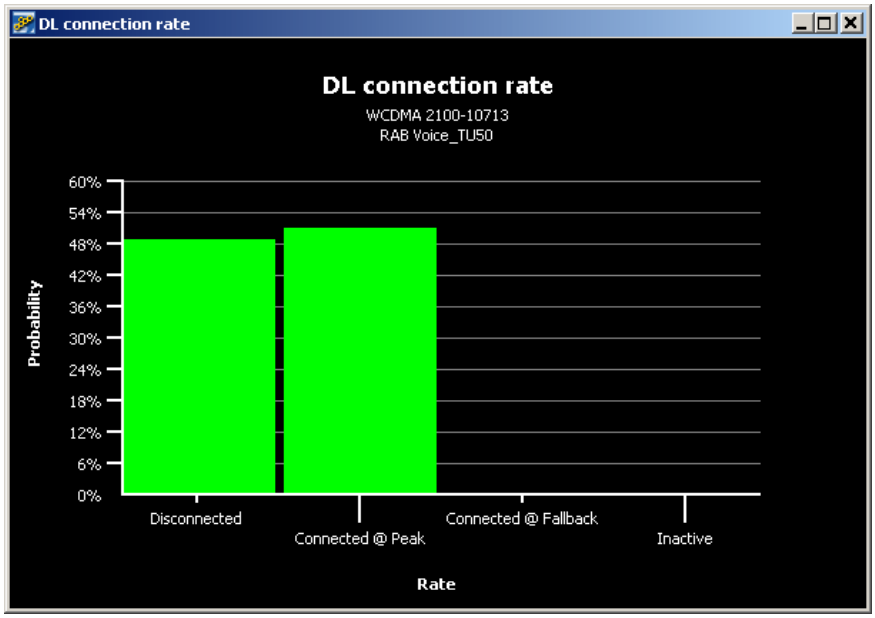


DL Connection Rate Chart

The DL Connection Rate Chart provides you with a quick overview of the user connection status for the selected WCDMA bearer. It shows the percent of all users attempting to connect to the network who have been disconnected, connected at the specified peak data rate, or on a fallback rate, if you have specified such a fallback rate for that particular WCDMA bearer.

Example Chart

The following example shows the DL Connection Rate Chart:



Connection Status Bar Chart

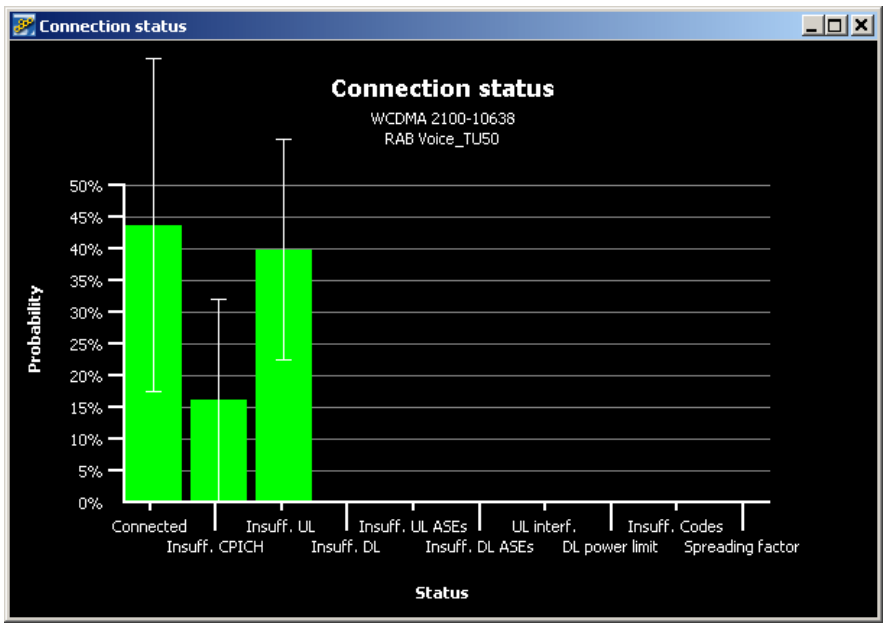
The Connection Status Bar Chart provides detailed information about the probability for all users attempting connection to the network of being connected or being rejected by the network due to different reasons.

The reason for not connecting users to the network is due to one or a combination of the following situations:

- Insufficient CPICH coverage
- Insufficient uplink or downlink coverage
- Insufficient amount of uplink or downlink ASE in cells
- Excessive uplink interference
- Exceeded downlink power limit
- Insufficient amount of orthogonal codes in the cells
- Limit for spreading factors 8, 16 or 32 has been exceeded

Example Chart

The following example shows the Connection Status Bar Chart:



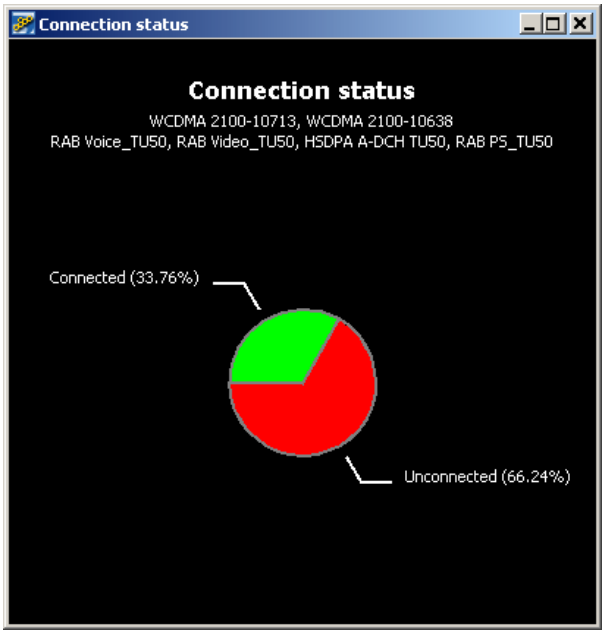
Connection Status Pie Chart

The Connection Status Pie Chart provides a quick overview on the percentage of users connected to the network on the selected WCDMA bearers. The chart considers:

- Total number of connection attempts
- Users successfully connected to the system
- Users not connected to the system for any reason

Example Chart

The following example shows the Connection Status Pie Chart:



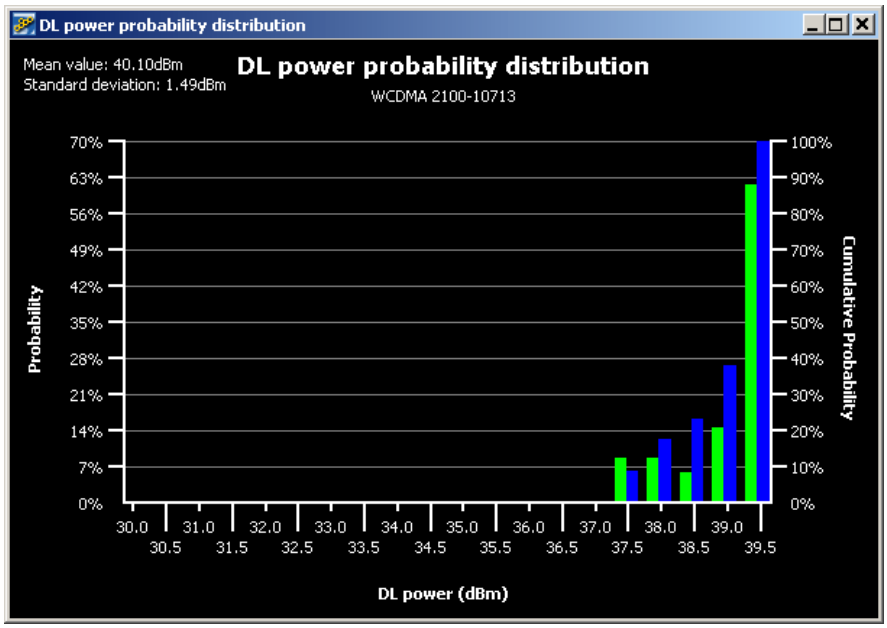
DL Power Chart

The DL Power Chart shows detailed statistical information for achieved downlink power of cells in the selected frequency channel. The chart displays the probability and cumulative distribution functions, the mean downlink power values, and the standard deviation for all frequency channels selected.

The chart allows you to quickly evaluate any cells in the network using excessive or insufficient downlink power. In these cases, an uneven traffic load distribution between the different cells of the network probably exists, indicating you may need to reconsider the network plan for highly loaded or under-loaded cells.

Example Chart

The following example shows the DL Power Chart:



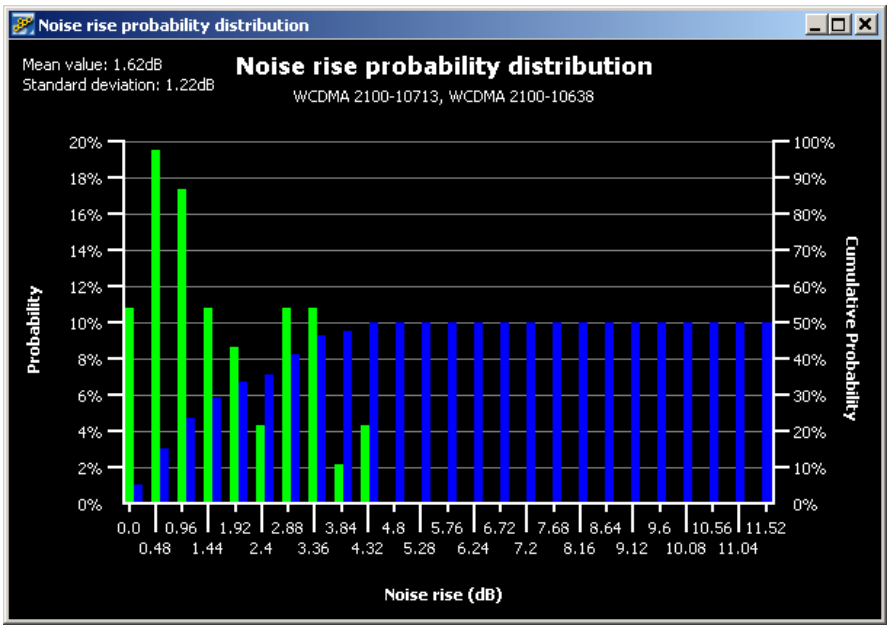
Noise Rise Chart

The Noise Rise Chart shows detailed statistical information for the achieved uplink noise rise of cells in the selected frequency channel. The chart displays the probability and cumulative distribution functions, the mean uplink noise rise values, and the standard deviation for all frequency channels selected.

The chart allows you to quickly evaluate any cells experiencing excessive or low uplink noise rise, probably indicating an uneven traffic load distribution between different cells in the network. You may need to reconsider the network plan for highly loaded or under-loaded cells.

Example Chart

The following example shows the Noise Rise Chart:



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